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Performance Tests of the Original Transonic Wind Tunnel Compressor and Circuit

Yoel Y. Link and Howard A. Quick

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Performance Tests of the Original Transonic Wind Tunnel Compressor and Circuit

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Air Operations Division
Aeronautical and Maritime Research Laboratory

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ABSTRACT

A detailed test programme of the AMRL Transonic Wind Tunnel was conducted. The objective of the test programme was to determine the pressure distributions around the tunnel circuit with larger nozzle exit areas. The existing high speed contraction, test section, model support mechanism, and downstream diffuser were removed for the tests. A variable nozzle and collector were designed and installed in place of the removed components to determine the effects of increasing the nozzle exit area. Three nozzle configurations were investigated, with a 38.3%, 44.4% and 58.1% increase in area relative to the existing test section area. Measurements were made of static pressure around the tunnel circuit, total pressure upstream and downstream from the compressor, and temperatures at various locations. Noise measurements were also made outside the tunnel complex and at four locations around the boundary of the site to determine the noise level of the wind tunnel.

RELEASE LIMITATION

Approved for public release

Performance Tests of the Original Transonic Wind Tunnel Compressor and Circuit

Executive Summary

DSTO's transonic wind tunnel test capability, and its potential for improvement, has been the subject of considerable investigation over the last decade. These investigations have focused on meeting future wind tunnel test requirements for the Australian Defence Force. The outcome has been to select the Transonic Wind Tunnel located at AMRL Melbourne for a facility upgrade. Approval for this decision was given during 1994 and DSTO awarded a Design and Construct Contract in 1995.

The Transonic Wind Tunnel upgrade proposal defined a requirement to increase the Transonic Wind Tunnel test section area (cross section) by approximately 50% relative to the existing test section, and to operate at Mach numbers from 0.3 to 1.4, continuously variable. Increasing the test section size will allow larger models to be tested at a higher Reynolds number, which improves the accuracy of the test data acquired.

The upgrade proposal identified that an assessment of the potential to use existing wind-tunnel components from the current facility be conducted. The major components to be assessed included the compressor and heat exchanger, and a programme to test these components was specified.

The test programme covered a six month period, and was completed in June 1994. The objectives were to determine the tunnel circuit losses, maximum capacity of the heat exchanger, feasibility of retaining the existing compressor, and noise levels associated with operation of the present Transonic Wind Tunnel.

The high speed contraction, test section, model support mechanism, and downstream diffuser were removed for the tests. A variable nozzle and collector were designed and installed in place of the removed components to determine the effects of increasing the nozzle exit area. Three nozzle configurations were investigated, with an increase in the cross sectional area of the test section of 38.3%, 44.4% and 58.1% relative to the existing test section area. Measurements were made of static pressure around the tunnel circuit, total pressure upstream and downstream from the compressor, and temperatures at various locations including cooling water to the heat exchanger. Noise levels were also measured outside the tunnel near surrounding buildings and at the boundary of the site.

This report provides detailed performance data of the original Transonic Wind Tunnel which was acquired during this test programme. It is a comprehensive summary of the information provided to tenderers for use in compiling their submissions for potential upgrade options.

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Yoel completed his Bachelor of Science in 1987 and his Bachelor of Engineering in Aeronautical Engineering in 1989, both at Sydney University, and joined the Aeronautical Research Laboratory at Melbourne the following year. He completed a Master of Business Administration in Technology Management in 1995 at Monash University. He has predominantly worked in Flight Mechanics and experimental aerodynamics in the Wind Tunnels. During this period he has accumulated experience in aerodynamics with the Jindivik, Tonic, PC-9, Mk82 store, Amphibious Transport (LPA) ship, and the Hydrographic Ship wind tunnel test programmes. He has also been responsible for the development of the wind tunnel data acquisition systems, and he has been involved with the Transonic Wind Tunnel Upgrade project.

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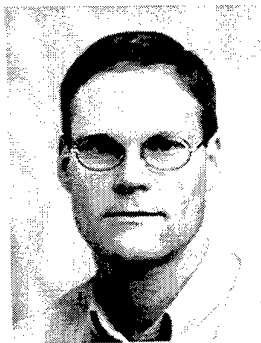
Howard completed a Bachelor of Engineering in Aeronautical Engineering at RMIT in 1988 and joined the Aeronautical Research Laboratory the following year. He has acquired experience in a number of areas including Computational Fluid Dynamics and aircraft performance while working in the Flight Mechanics Technology field, and has specialised in the area of experimental aerodynamics of RAAF aircraft and stores. In addition to this test programme in the transonic wind tunnel, two of the major wind tunnel test programmes that he has been involved with are the F/A-18 (IFOSTP), and the Mk-82 store.

Contents

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Notation

AMRL	–	Aeronautical and Maritime Research Laboratory
Atm	–	atmosphere
H	–	Tunnel total pressure
INCR	–	Incremental tests
kPa	–	kilopascals
l/s	–	litres per second
M	–	Mach number
MAX1	–	Maximum compressor speed test during the day
MAX2	–	Maximum compressor speed test at night
m	–	metre
mm	–	millimetres
N1	–	Nozzle 1
N2	–	Nozzle 2
N3	–	Nozzle 3
P	–	Plenum chamber static pressure
psi	–	pounds per square inch
psia	–	pounds per square inch absolute
psid	–	pounds per square inch differential
RPM	–	revolutions per minute

d	–	inner diameter of the cooling water pipe
h_w	–	differential pressure measured in inches of water gauge
q	–	flow rate
C_p	–	pressure coefficient
G_f	–	flowing specific gravity of liquid
K	–	flow coefficient factor
N_{vG}	–	N factor for flowing volume with specific gravity determination

1. Introduction

Over the last decade attempts have been made to improve the transonic wind tunnel testing capability at the Aeronautical and Maritime Research Laboratory (AMRL). Initially, effort was directed at acquiring a new continuous flow tunnel with a 1.5 m square test section that would operate at Mach numbers from 0.3 to 1.6 and at pressures up to 3 atmosphere. Primarily due to Defence facilities budget constraints insufficient funds were available for this tunnel, so it was decided to upgrade the transonic wind tunnel (TWT) located at AMRL, Melbourne. The upgrade requirements are: to increase the test section area by at least 50% relative to the current test section area; to operate at Mach numbers of 0.3 to 1.4 continuously variable; and to operate at a pressure of 2 atmosphere (Reference 1).

The objectives of the tests described in this report were to determine:

- the tunnel circuit losses to provide a basis for increasing the maximum test section size that could be achieved using the existing compressor;

- the heat exchanger cooling water inlet and outlet temperatures and flow rate to assist with estimating the maximum capability of the existing heat exchanger;

- the feasibility of retaining the existing compressor by modifying the stator blade angles; and

- the noise levels emanating from the transonic wind tunnel when operating.

The tests required major modifications to the tunnel circuit inside the plenum and changing the angle of the stator blades in the compressor. The tunnel circuit, from the bolted joint in the contraction (Figure 1 – Station 2286) to the downstream end of the sliding diffuser (Figure 1 – Station 9828), was removed and replaced by a variable area nozzle and a collector. Measurements were taken of static pressure at various locations around the tunnel circuit, total pressure upstream and downstream of the compressor, and temperatures at various locations. The locations at which these measurements were made are shown in Figure 2. The preparation and testing was performed from December 1993 to June 1994.

2. Equipment Description

2.1 Nozzle

The nozzle consisted of a steel outer shell, with a range of timber inserts mounted on each surface to achieve the different nozzle exit areas. A schematic representation of the nozzle and collector in the plenum chamber is shown in Figure 2. The nozzle inserts were designed to continue the smooth surface curvature of the existing low-speed contraction (Figure 1 – Station 0 to Station 2286). This nozzle was designed and manufactured at AMRL.

The existing transonic wind tunnel test section dimensions are 810 mm x 532 mm, and the test section area is 0.43092 m^2. In order to establish a reasonable definition of the compressor operating lines, three nozzle exit areas ranging from 0.6 m^2 to 0.7 m^2 were identified. Three nominal test section area increases (from the existing test section area) of 40%, 45% and 60% were decided upon. After design constraints, such as the

need to retain the contraction's smooth curvature without introducing any discontinuity, and to keep the design simple and inexpensive, three nozzle exit areas, as shown in Table 1, were designed and manufactured.

Table 1. Nozzle Exit Areas

Nozzle	Dimensions (mm)	Nozzle Area (m²)	Increase in area from original test section
N1	946 H x 631 W	0.5969	38.5%
N2	946 H x 657 W	0.6215	44.2%
N3	946 H x 720 W	0.6811	58.1%

Figures 3 and 4 show the four temperature probes and the total pressure probe mounted in the nozzle. The temperature probes were located 440 mm upstream of the nozzle exit, while the total pressure tube had its face aligned with the nozzle exit. The temperature probes were located 200 mm from the nozzle wall, while the total pressure tube had its face 110 mm below the upper insert's surface.

2.2 Collector

The collector, shown in Figure 2, was designed at AMRL and manufactured at Shearform Industries Pty Ltd. The collector was installed in place of the existing test section and diffuser and provided the interface between the rectangular exit of the nozzle and the round section of the existing diffuser at the sliding joint. The constant diameter tube and flared conical opening was used to avoid pulsations in the flow and to minimise losses in the air mass flow around the tunnel circuit.

Figure 2 gives the pertinent dimensions of the collector and nozzle as installed for the test programme. The collector has a constant internal diameter of 998 mm. The opening is flared at 30 degrees to form a conical end with a major diameter of 1350 mm. Figures 5 and 6 show the collector mounted in the plenum chamber prior to testing.

2.3 Heat Exchanger Temperature Probes and Support Frame

Four temperature probes were used to measure the temperature in front of the heat exchanger and these were mounted in a square shaped support frame (1 m x 1 m) with the probes fixed at the corners of the frame as shown in Figure 7. This support frame was mounted upstream of the heat exchanger on the central fairing using existing attachment points, as shown in Figure 8, with the lower two temperature probes located 1.5 m above the floor of the chamber. The temperature probes were located 350 mm upstream of the heat exchanger face.

2.4 Temperature Probes

Temperature measurements were taken at fourteen locations as shown in Figure 2 and consisted of:

1. freestream air temperature at four locations upstream of the heat exchanger and four locations at the bolted joint in the contraction (Figure 1 – Station 2286). These

eight temperatures were measured using temperature probes, shown in Figure 9, containing ALPHA/THERM type M-KN 3045 platinum resistance temperature detectors;

2. the inner surface skin temperature of the plenum chamber measured at two locations at Station 5714 (Figure 2), using ALPHA/THERM type M-FK 220 thin film platinum resistance elements as shown in Figure 10;

3. the outer surface skin temperature at two locations just downstream of the compressor using ALPHA/THERM type M-FK 220 thin film platinum resistance elements; and

4. the temperature of the cooling water in the inlet and outlet heat exchanger pipes, using thermowells containing ALPHA/THERM type M-KN 3045 platinum resistance temperature detectors, as shown in Figure 11.

The temperatures were measured in series using the rotary selector and readout shown in figure 12.

2.5 RPM Sensor

The compressor rotational speed was measured using a Rechner IAS-10-A13-S inductive proximity sensor as shown in Figure 13, and a Kyodo Denki AP-05E digital tachometer. The sensor was located beside the compressor cardan shaft coupling and measured twelve bolt heads per revolution.

2.6 Psychrometer

The wet and dry bulb temperatures were measured using a psychrometer. The measurements were obtained outside the front entrance of the transonic wind tunnel building.

2.7 Annubar and Digital Pressure Meter

The water flow rate was measured using a Dieterich Standard, Diamond 2 Annubar Flow Sensor, in conjunction with a Moore Mycro XTC Differential Pressure Transducer to display pressure difference across the annubar shown in Figure 14. The pressures were recorded at each test condition and the flow rate calculated using a standard formula for this system.

The formula used to calculate the flow rate is given in Reference 2 and is:

$$q = N_{vG} K d^2 \sqrt{\frac{h_w}{G_f}}$$

where:

q is the flow rate in units determined by the N factor;

N_{vG} is the N factor for flowing volume with specific gravity determination, and is equal to 5.6665 for q in U.S. gallons per minute, and 0.3575 for q in litres per second (Reference 2, p. 9-37);

K is the flow coefficient factor and is equal to 0.6337 for this annubar;

d is the inner diameter of the pipe in inches and is equal to 6.065 in;

h_w is the differential pressure measured in inches of water gauge[1]; and

G_f is the flowing specific gravity of cooling water, and is approximately equal to 1.0 at the test conditions (Reference 2, p. E-10).

2.8 Total Pressure Rakes and Total Pressure Probe

Two total pressure rakes were used to measure pressures just upstream and downstream of the compressor as shown in Figure 15. Total pressure rake #1 (Figure 16) was installed approximately 280 mm upstream from the compressor's inlet guide vanes. Total pressure rake #2 (Figure 17) was installed approximately 180 mm behind the compressor's outlet guide vanes.

The total pressure rakes were manufactured from tubing with an outer diameter of 2.0 mm and internal diameter of 1.5 mm. The length from the stiffener to the tube face was 47 mm. Figures 16 and 17 give details of the radial positions of the tubes between the tunnel's outer shell and compressor's internal fairing.

2.9 Tunnel Static Pressures

Static pressure holes were located around the tunnel circuit at the positions shown in Figure 2. At each position a 2.5 mm hole was drilled through the tunnel shell and then an 11.1 mm diameter hole drilled to within 2 mm of the shell inner surface. The 11.1 mm hole was then tapped to fit a Swagelok SS-400-2-4ST elbow fitting as shown in Figure 18. All holes were deburred on the inner surface. Nylon pressure tubing (outer diameter 6.4 mm) was connected between the Swagelok fittings and a PSI pressure scanning system.

2.10 Pressure Measurement System

All pressures were measured and recorded using a PSI 8400 electronic pressure measurement and data acquisition system. Two pressure scanners with a range of ±5 psid were used to measure the pressures. The static pressure in the tunnel plenum chamber was used as the reference pressure for the differential transducers, and it was measured using a 23 psia digiquartz pressure transducer.

The software controlling the data acquisition allows the user to specify the sampling parameters. The time between each data frame was set to 65000 μs. The number of frames was set to 50, and the procedure was repeated 3 times with a 5 second delay between each sampling period. This resulted in 3 sets of pressure data for each data point. The tabulated pressure results are the mean of the 3 sets of data.

2.11 Blade Stagger Angle Setting Tool

The stagger angle of each of the compressor's stator blades was to be reduced by 10° using the tool shown in Figure 19. The following procedure was performed on the inlet guide vanes, and on the 1st, 2nd, and 3rd rows of stator vanes, to alter the blade stagger angle on each of the total of 176 vanes:

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[1] The differential pressure transducer measurement units in the tests were kiloPascals, therefore, the reading must be converted, by dividing by 0.2491, to give a differential pressure in inches of water gauge.

4

1. each stator half ring was removed from the compressor casing and placed horizontally on a workbench;

2. using the horizontal surface of the half ring the tool was positioned so that the circular arc section of the tool was aligned with the circular stem of the blade;

3. three positions, indicating the current blade angle, current angle plus 10°, and current angle minus 10°, were scribed on the inner surface;

4. the two bolts holding the blade in position were loosened, the blade was rotated to the new angular setting (current minus 10°), and the two bolts tightened.

The change in the stator blade angle caused the leading edge of the blade to protrude beyond the edge of the inner ring (Figures 20a and 20b). Unfortunately, the protruding blades had the potential to interfere with the rotor blades and cause major damage to the compressor if it had been operated in this configuration.

After further consideration of the test requirements, it was decided that the baseline data would have to be sufficient and that there was little benefit in testing with a blade stagger angle reduction of less than 10°. Reduced angle settings (less than 10°) were considered but it was estimated that this would not provide the increased performance needed and consequently the tests with reduced blade stagger angles were not pursued.

2.12 Sound Level Measurement

A Brüel and Kjær Type 2225 integrating sound level meter was used to measure the sound levels at locations within close proximity to the wind tunnel complex and at the perimeter of the site.

3. Test Programme Procedure

The compressor tests were to be carried out in two phases. The first series of tests, the baseline tests, were carried out without making any modifications to the compressor, and the second series were to be carried out with the required modifications to the compressor stator blade stagger angles. Based on data requirements, three specific tests were identified for each of the three nozzles, one test acquiring data over a compressor speed range with 20 RPM increments, a maximum compressor speed test during normal tunnel running hours, and a maximum compressor speed test at night. In both maximum speed tests data was acquired at 5 minute intervals for up to a maximum of 3 hours. The test programme carried out is contained in Table 2. All the tests were made at a tunnel starting pressure of approximately 0.5 Atm.

Table 2. Transonic wind tunnel compressor test programme

Test Case	20 RPM increments (INCR)		Max RPM (MAX1)		Max RPM at night (MAX2)	
Nozzle Area Increase	Baseline	Blade mods.	Baseline	Blade mods.	Baseline	Blade mods.
38.5% (N1)	9/5/94 AM	n/a	10/5/94 AM	n/a	10/5/94 PM	n/a
44.2% (N2)	11/5/94 PM	n/a	12/5/94 AM	n/a	12/5/94 PM	n/a
58.1% (N3)	13/5/94 PM	n/a	17/5/94 AM	n/a	16/5/94 PM	n/a

3.1 Baseline Tests

For the 20 RPM incremental tests (INCR) the compressor was operated from 400 to 1160 RPM (maximum operating RPM = 1200). Operation at 1160 RPM was limited to less than 2 minutes to avoid thermal overload of the electric motor control unit.

For the maximum continuous RPM tests (MAX1 and MAX2), which were carried out over 3 hours, the compressor speed was limited to 1100 RPM. However, the maximum continuous RPM tests for Nozzle 3 (58.1% increase in test section area) could only be carried out over a period of 2.5 hours due to overheating in the electric motor control unit.

3.2 Sound Level Tests

Sound level measurements were acquired within close proximity to the wind tunnel complex and around the AMRL site at four locations as shown in Figure 21. Measurements were only recorded during the tests on Nozzle 1, as it was shown by a limited sample of measurements that the sound levels did not vary considerably with the different nozzle areas.

4. Results

Appendix A contains the tabulated results for the baseline tests. The temperature data for all the tests is included and the nomenclature used is given in Table 3. The complete pressure data for the incremental tests is also included, and pressure coefficients over each entire run are calculated for the maximum continuous RPM test cases. The format of the pressure data is given in Table 4. The mean pressure data in Appendix A is presented as both differential and absolute pressure values. The pressure data is presented graphically in Figures 22–26, and the temperature data is presented in Figures 27–30.

Analysis of the pressure data presented in Figures 22-26 should take into consideration the characteristics of this wind tunnel, particularly that there is no controller to hold the tunnel pressure constant over the test duration. This is evident by the increase in static pressure of approximately 1 psi (at 0 RPM) from the start of the test to the end of the test.

Table 3. Description of temperature data format

Notation	Description
Time	Time of data acquisition
RPM	Compressor speed
H (kPa)	Tunnel total pressure, in kilopascals, which is taken to be the static pressure in the settling chamber
P (kPa)	Plenum chamber static pressure in kilopascals, measured by 23 psia digiquartz
M	Mach number calculated from P and H
T1 – T4	Temperatures (°C) in nozzle
T5 – T8	Temperatures (°C) in front of heat exchanger
T9 – T10	Temperatures (°C) on inner surface of plenum chamber skin at Station 5714 (Figure 1)
T11 – T12	Temperatures (°C) on the tunnel outer skin 1125 mm downstream from compressor
T13	Temperature (°C) of heat exchanger outlet cooling water
T14	Temperature (°C) of heat exchanger inlet cooling water
Twet (°F)	Wet bulb temperature in degrees Fahrenheit
Tdry (°F)	Dry bulb temperature in degrees Fahrenheit
q (l/s)	Heat exchanger cooling water inlet flow rate in litres per second

Table 4. Description of pressure data format

Transducer	sc-01 (Scanner 1)	sc-02 (Scanner 2)
1	Static pressure in plenum chamber	Static pressure in plenum chamber
2	Reference check pressure	Reference check pressure
3	Compressor Rake 1 Tube 1 (R1T1)	Static pressure before first corner (B1)
4	Compressor Rake 1 Tube 2 (R1T2)	Static pressure after first corner (A1)
5	Compressor Rake 1 Tube 3 (R1T3)	Static pressure before second corner (B2)
6	Compressor Rake 1 Tube 4 (R1T4)	Static pressure before third corner (B3)
7	Compressor Rake 1 Tube 5 (R1T5)	Static pressure after third corner (A3)
8	Compressor Rake 2 Tube 1 (R2T1)	Static pressure after fourth corner (A4)
9	Compressor Rake 2 Tube 2 (R2T2)	Static pressure in settling chamber (SC)
10	Compressor Rake 2 Tube 3 (R2T3)	Static pressure in plenum chamber (PC)
11	Compressor Rake 2 Tube 4 (R2T4)	Total pressure at nozzle exit (TOT)
12	Compressor Rake 2 Tube 5 (R2T5)	

4.1 Tunnel Circuit Pressure

The effect of the different nozzle exit areas on the pressures around the tunnel circuit is presented using pressure coefficients. The pressure coefficients were calculated using the following formula:

$$C_p = \frac{P(\text{location}) - P(\text{ref})}{q(\text{ref})}$$

where:

P(location) = pressure reading at tunnel circuit location

P(ref) = static pressure in plenum chamber

q(ref) = dynamic pressure in the nozzle

The pressure coefficients were calculated for each tunnel circuit location and are plotted in Figures 25 and 26. The pressure coefficients presented are averaged "mean" values. The standard deviations associated with these averages indicate little variation across the data points sampled.

4.2 Tunnel Circuit Air Temperature

The temperature plots given in Figures 27–30, are an average of the data taken at each of the locations, for example, the temperature in front of the heat exchanger is calculated from an average of T1, T2, T3 and T4. Obviously, at those locations where only one measuring device was located, in the inlet and outlet cooling water pipes, the data cannot be averaged. The data is plotted for all the maximum continuous RPM tests as the objective of acquiring the temperature data was to determine the temperature variation with time at the maximum compressor speed. A plot of the variation of temperature with RPM (an incremental test) is given for Nozzle 1 in Figure 30. Similar trends occurred for the other nozzles but they are not shown graphically.

At the completion of the Nozzle 2 – Incremental tests the temperature data was analysed and one of the heat exchanger temperature probes (T1) was found to be in error over the RPM range 0–680. Therefore, in analysing the data from Appendix A.5, T1 was not used in calculating the mean temperature in front of the heat exchanger over the RPM range 0 – 680.

4.3 Cooling Water Temperature and Flow Rate

During two of the maximum RPM tests a malfunction of the cooling tower water shut off valve occurred causing partial closure of the valve. This was immediately recognised by the decrease in the water flow rate from 58.0 l/s to 40.9 l/s in the case of Nozzle 2 – MAX1, and from 58.3 l/s to 41.5 l/s in the case of Nozzle 3 – MAX1. This occurrence is clearly shown by the sharp increase (approximately 1°C – 1.5°C) in the temperatures at the heat exchanger, nozzle and cooling water outlet in the corresponding graphs in Figures 28 and 29 at the elapsed times of 2 hours 45 minutes and 1 hour 30 minutes respectively. The valve was manually returned to the fully open position and the flow rate returned to its regular level.

The water flow rate was measured using a differential pressure transducer in conjunction with an annubar as described in section 2.7. The readout of the differential pressure transducer during the tests varied between 11.0 kPa and 13.0 kPa, corresponding to 55.3 l/s and 60.0 l/s respectively. The flow rate value in the tabulated data is an average of the high and low values observed at each test point.

4.4 Measurement Accuracy

The PSI 8400 pressure measurement system has an accuracy of 0.5% of the full-scale value of the transducers. In this test ±5 psid transducers were used and the error in the pressure data is therefore ±0.025 psi.

The temperature equipment was calibrated over the range of temperatures required and found to be accurate to within ±0.6°C.

4.5 Sound Levels

The results of the sound level measurements are contained in Appendix A.6.

5. Conclusion

This report describes the transonic wind tunnel tests performed in support of the AMRL transonic wind tunnel upgrade project. A full description of the equipment used, the location of all equipment, and a compilation of all the test results is presented.

The data acquired from these tests will be used, by the tenderers for the Transonic Wind Tunnel Upgrade project, in determining the different option packages put forward that will provide a range of increases in the wind-tunnel performance.

6. Acknowledgement

The authors would like to thank I. Arnott, D. Carnell, J. Clayton, A. Gonzalez, S. Lam, P. Malone, and N. Matheson for their assistance in the preparation and testing of the transonic wind tunnel.

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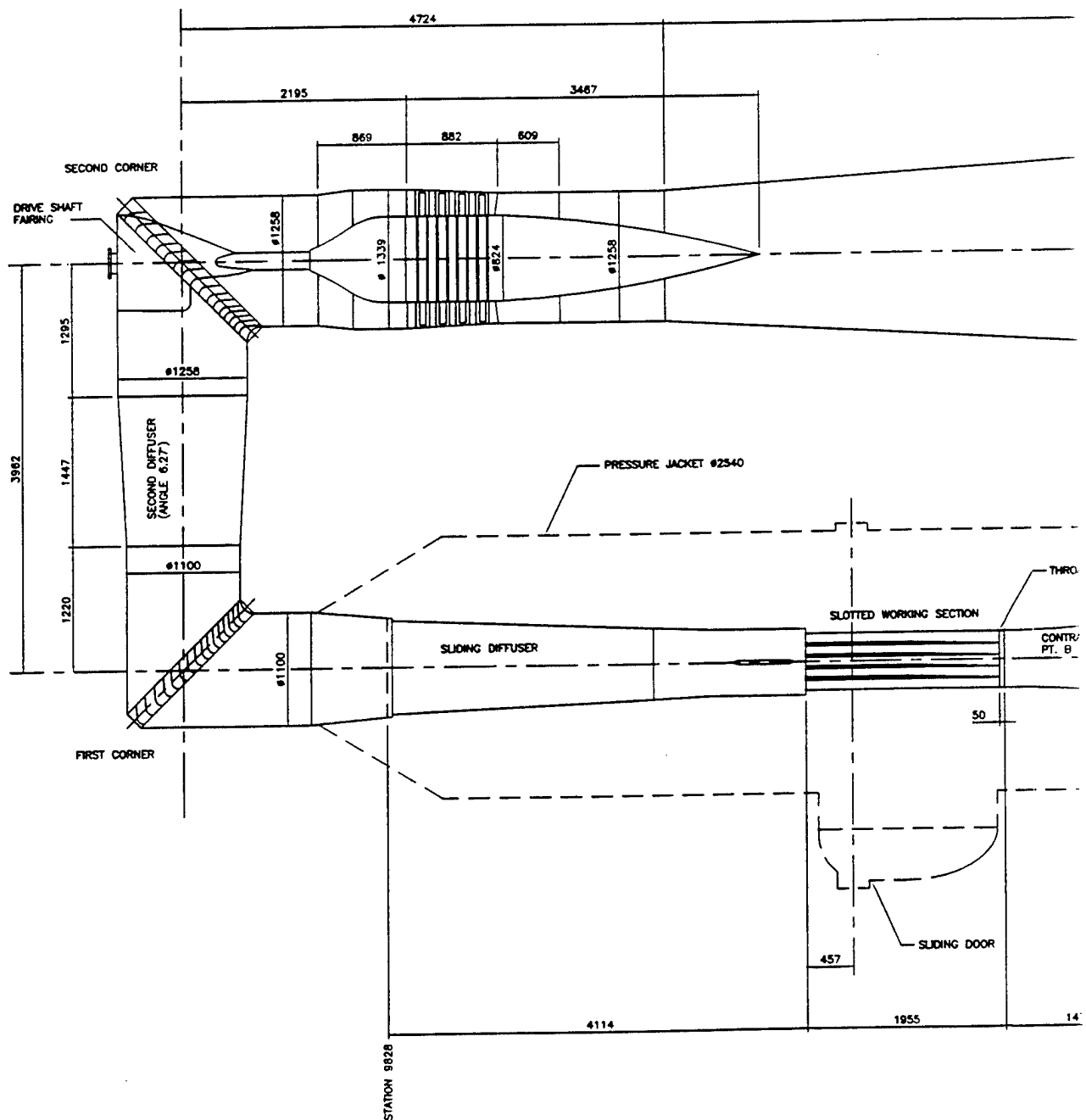
FIGURE 1. SCHEMATIC DIAGRAM OF

①
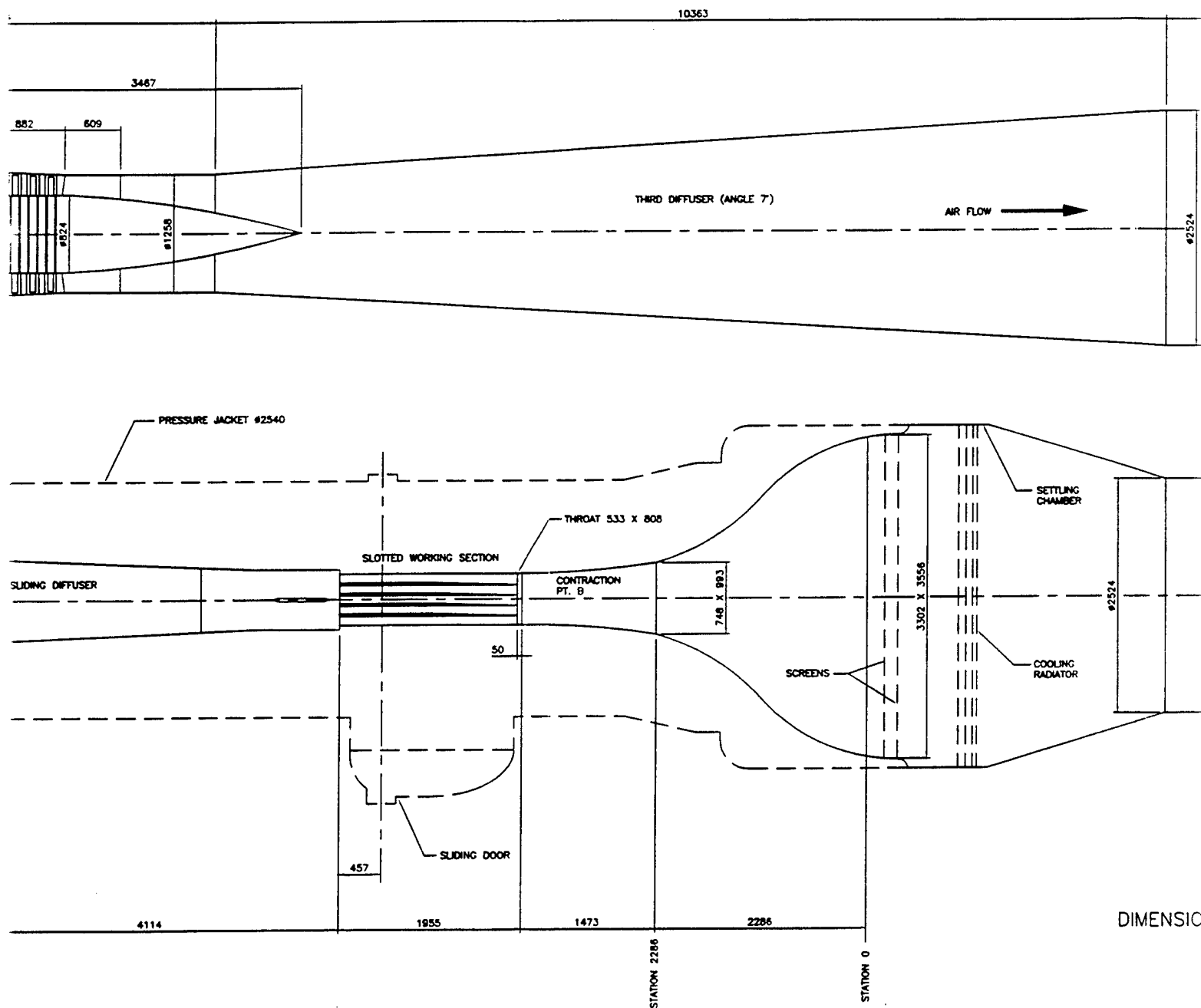
FIGURE 1. SCHEMATIC DIAGRAM OF ORIGINAL TRANSONIC WIND TUNNEL

10363

1981

THIRD CORNER

THIRD DIFFUSER (ANGLE 7°)

AIR FLOW →

TURNING VANES
6.3mm ALUMINIUM
SHEET SPACED
ARITHMETICALLY

Ø2524

SAFETY
DIAPHRAGM

Ø2524

SETTLING
CHAMBER

THROAT 533 X 806

3302 X 3556

CONTRACTION
PT. B

748 X 993

Ø2524

SCREENS

COOLING
RADIATOR

FOURTH CORNER

DIMENSIONS IN mm

1473

2286

STATION 2286

STATION 0

OF ORIGINAL TRANSONIC WIND TUNNEL

FIGURE 2. SCHEMATIC DIAGRAM OF TRANS(

10363

3467

482 609

THIRD DIFFUSER (ANGLE 7°)

AIR FLOW →

ø2524

ø824

ø1256

PRESSURE

TEMPERATURE PROBES (2)
(TUNNEL SKIN TEMP.)

EXISTING
STATIC PRESSURE
PORT. PC

TEMPERATURE PROBES (4)

SETTLING
CHAMBER

TEMPERATURE PROBES (4)

PRESSURE JACKET ø2540

TOTAL
PRESSURE
PROBE, TOT

748 x 993

3302 x 3556

ø2524

TEMPERATURE PROBES (2)
(TUNNEL SKIN TEMP.)
(INSIDE PLENUM)

COOLING
RADIATOR

SCREENS

SLIDING DOOR

NEW NOZZLE

EXISTING
STATIC PRESSURE
PORTS, SC

6805

495 440

2286

STATION 5714

STATION 2286

STATION 0

DIMENSION

FIGURE 2. SCHEMATIC DIAGRAM OF TRANSONIC WIND TUNNEL AND EQUIPMENT LOCATION

2

10363   1981

STATIC
PRESSURE B3

THIRD CORNER

THIRD DIFFUSER (ANGLE 7°)   AIR FLOW ➡

φ2524

TURNING VANES
6.3mm ALUMINIUM
SHEET SPACED
ARITHMETICALLY

SAFETY
DIAPHRAGM

EXISTING
STATIC PRESSURE
PORT. PC

TEMPERATURE PROBES (4)

SETTLING
CHAMBER

TEMPERATURE PROBES (4)

φ2524

STATIC
PRESSURE A3

X
X X
X

748 X 993

3302 X 3556

X
X X
X

φ2524

COOLING
RADIATOR

SCREENS

NEW NOZZLE

STATIC
PRESSURE A4

FOURTH CORNER

495   440   2286

EXISTING
STATIC PRESSURE
PORTS. SC

STATION 2286

STATION 0

INLET TEMP. AND
INLET FLOW RATE

OUTLET TEMP.

OUTDOOR AMBIENT
WET AND DRY BULB
TEMP.

DIMENSIONS IN mm

RANSONIC WIND TUNNEL AND EQUIPMENT LOCATION

3

Figure 3. *Nozzle exit looking upstream showing mounting of inserts, temperature probes, and total pressure probe*
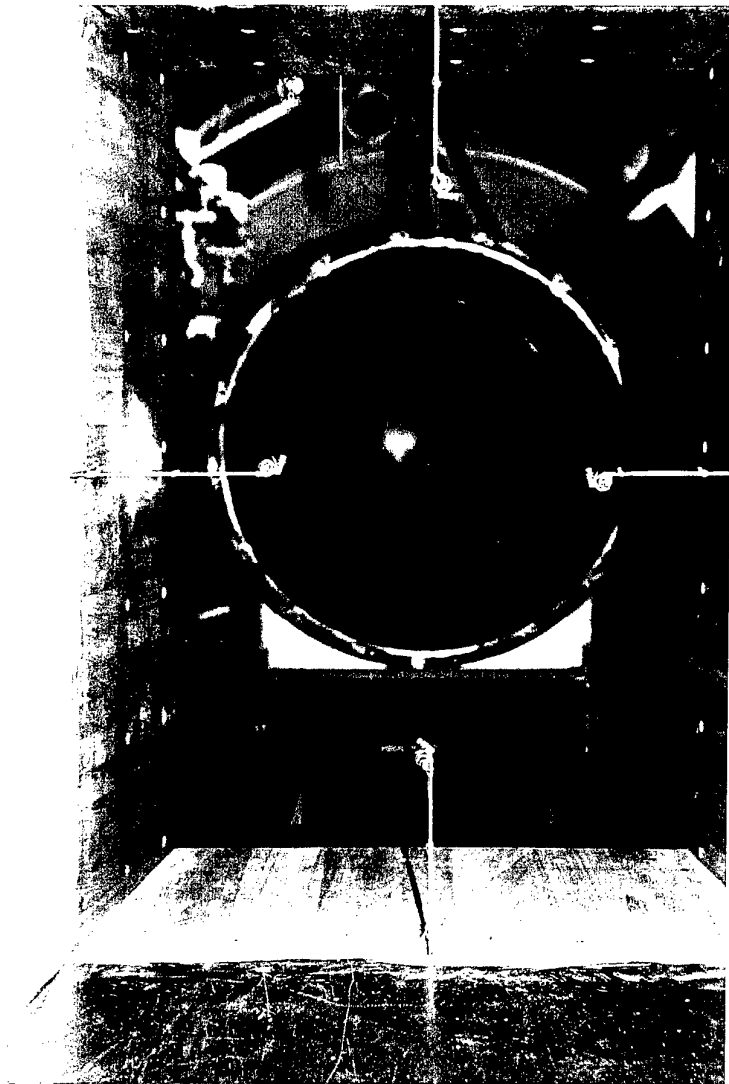
Figure 4. Nozzle and temperature probes looking downstream from inside the contraction towards the collector
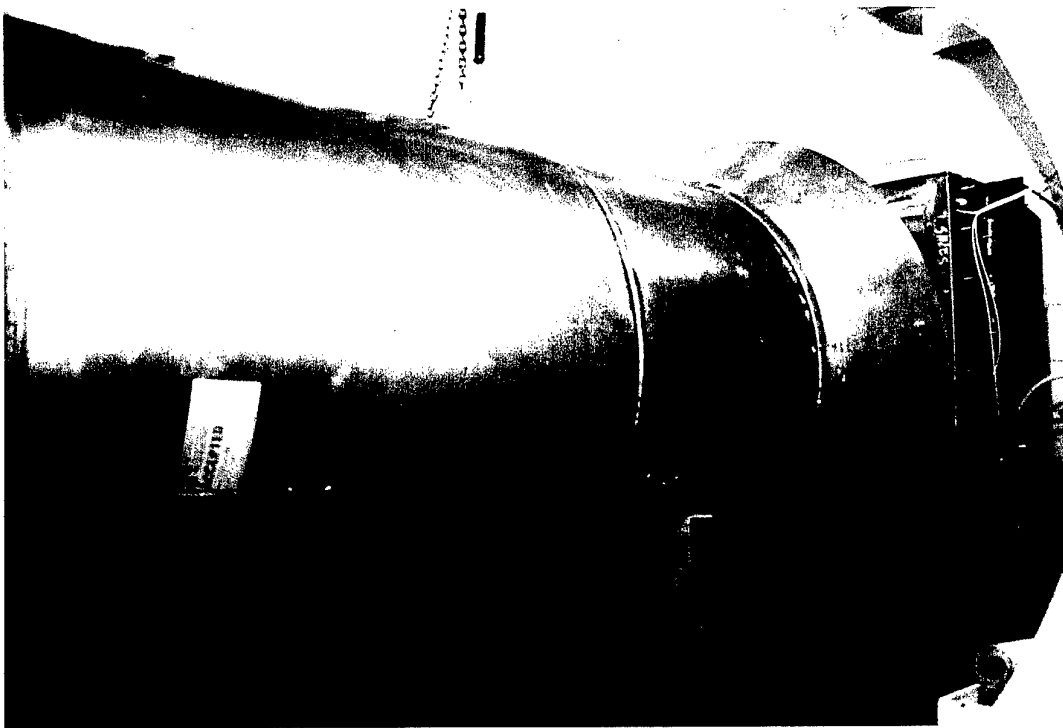
Figure 5. Collector installed in plenum chamber looking upstream
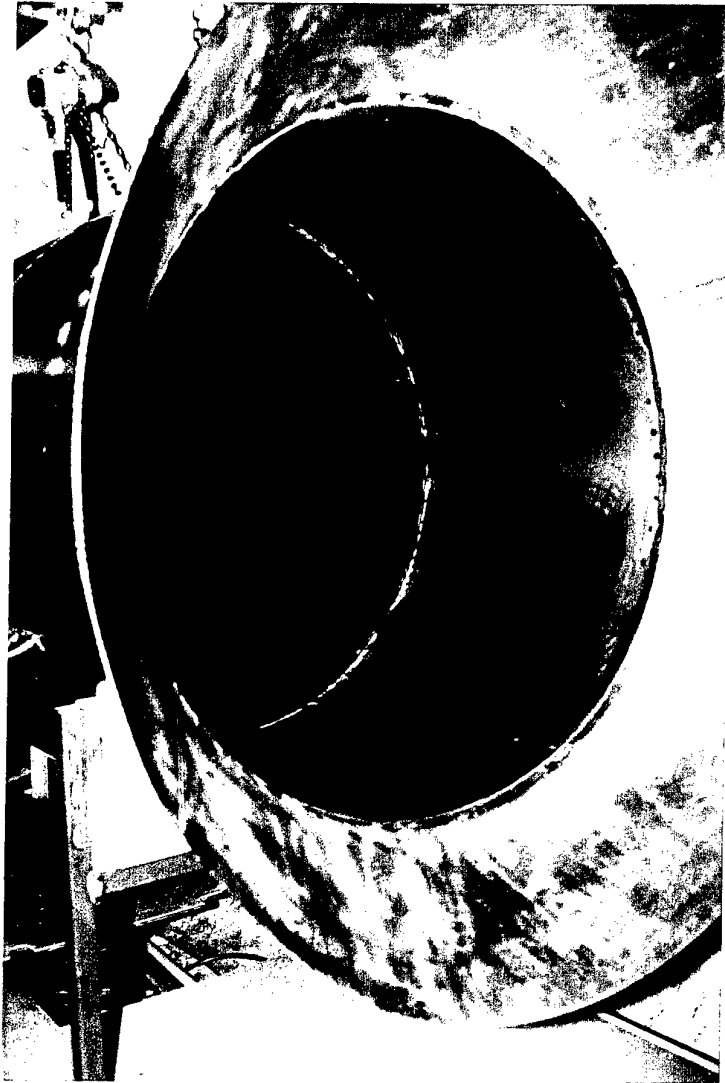
Figure 6. Collector conical opening looking downstream

1 m

Shell (edge of heat exchanger)

1 m

#1   #2

1 m

#4   #3

1.5 m
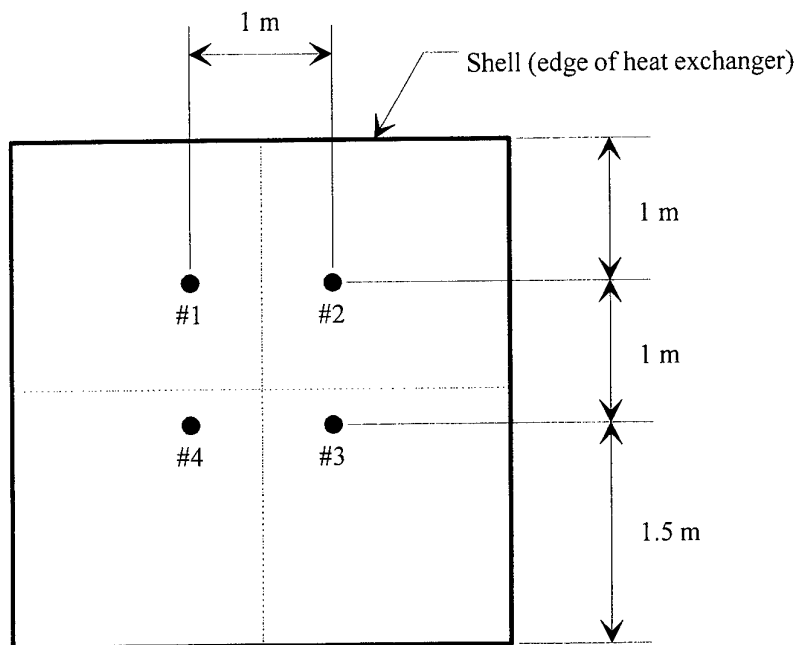
Tips of Probes are located 350 mm forward of heat exchanger face. (see figure 2)

Figure 7. Location of temperature probes in front of heat exchanger
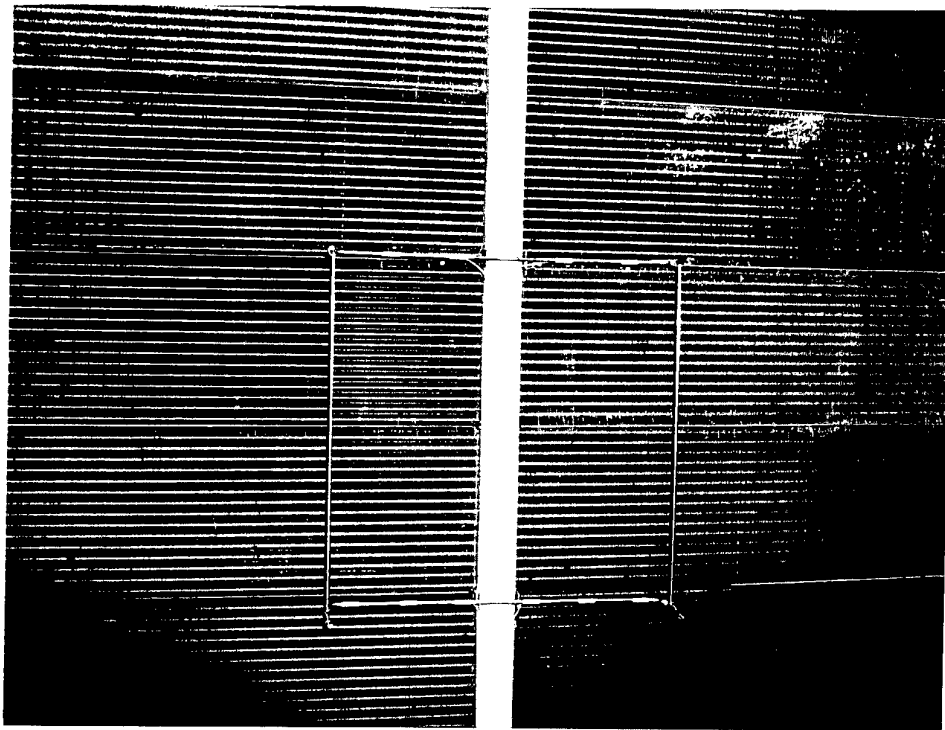
Figure 8. Heat exchanger temperature probes on support frame as installed
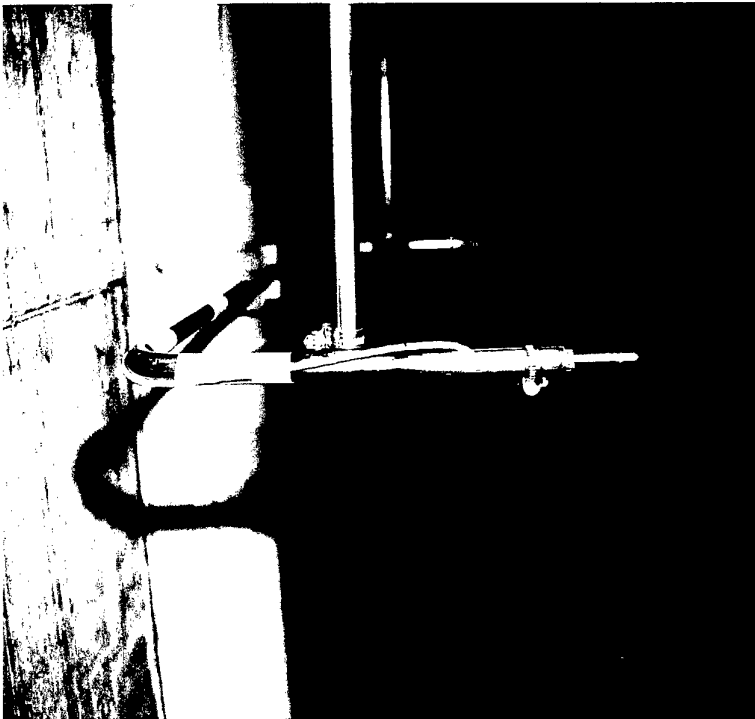
Figure 9. Air temperature probe

Figure 10. Surface mounted temperature probe in the plenum chamber
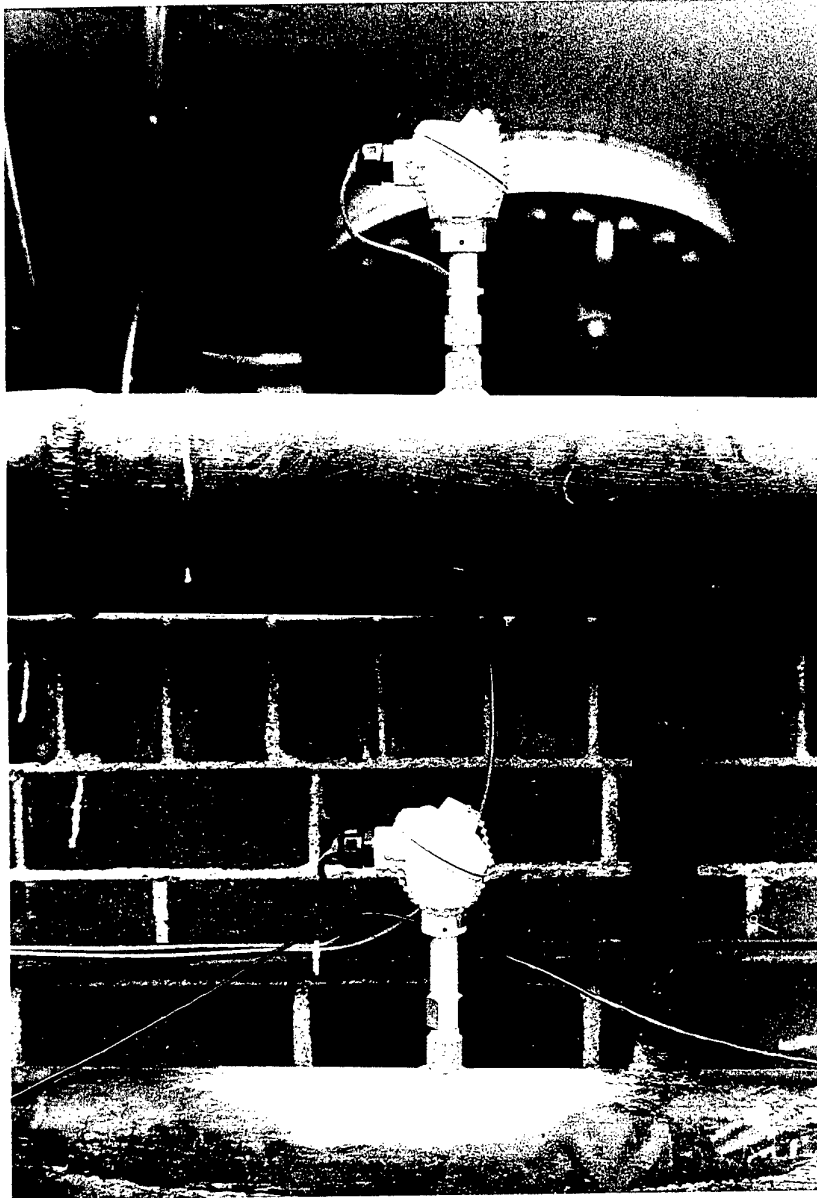
Figure 11. Thermowells in cooling water inlet and outlet pipes
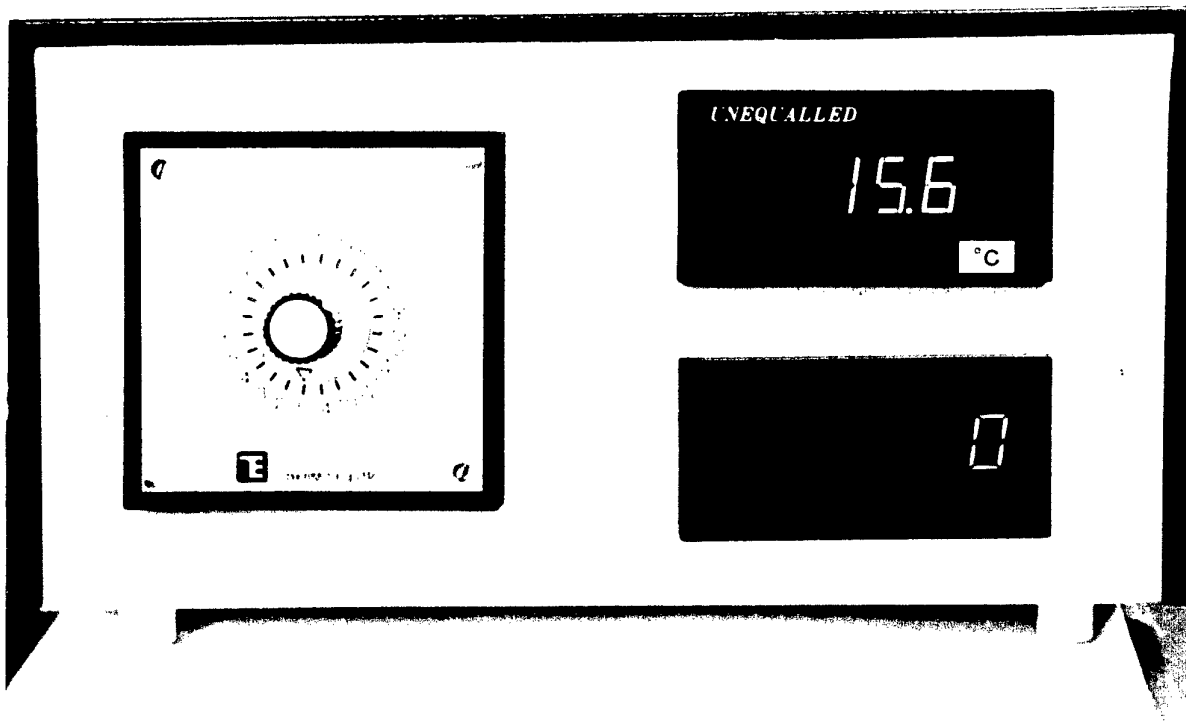
Figure 12. Temperature and RPM indicator equipment
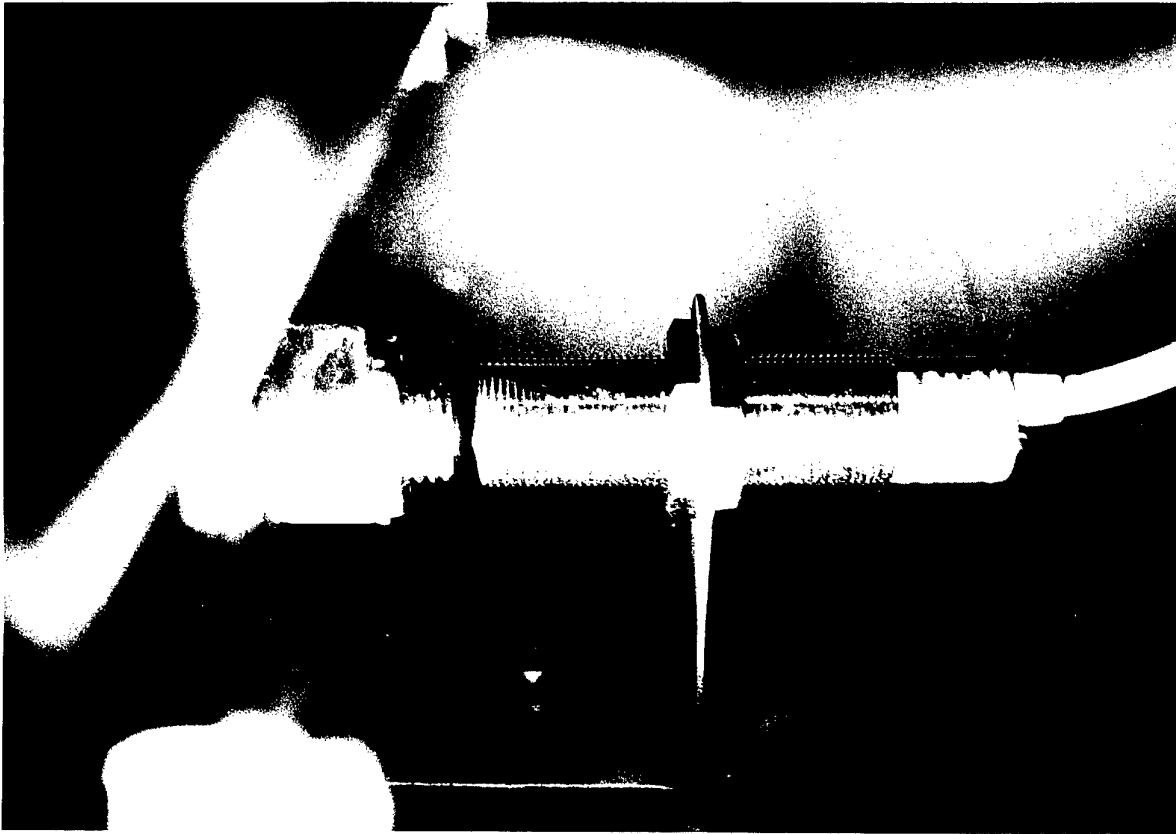
Figure 13. Inductive sensor shown opposite a compressor drive cardan shaft bolt
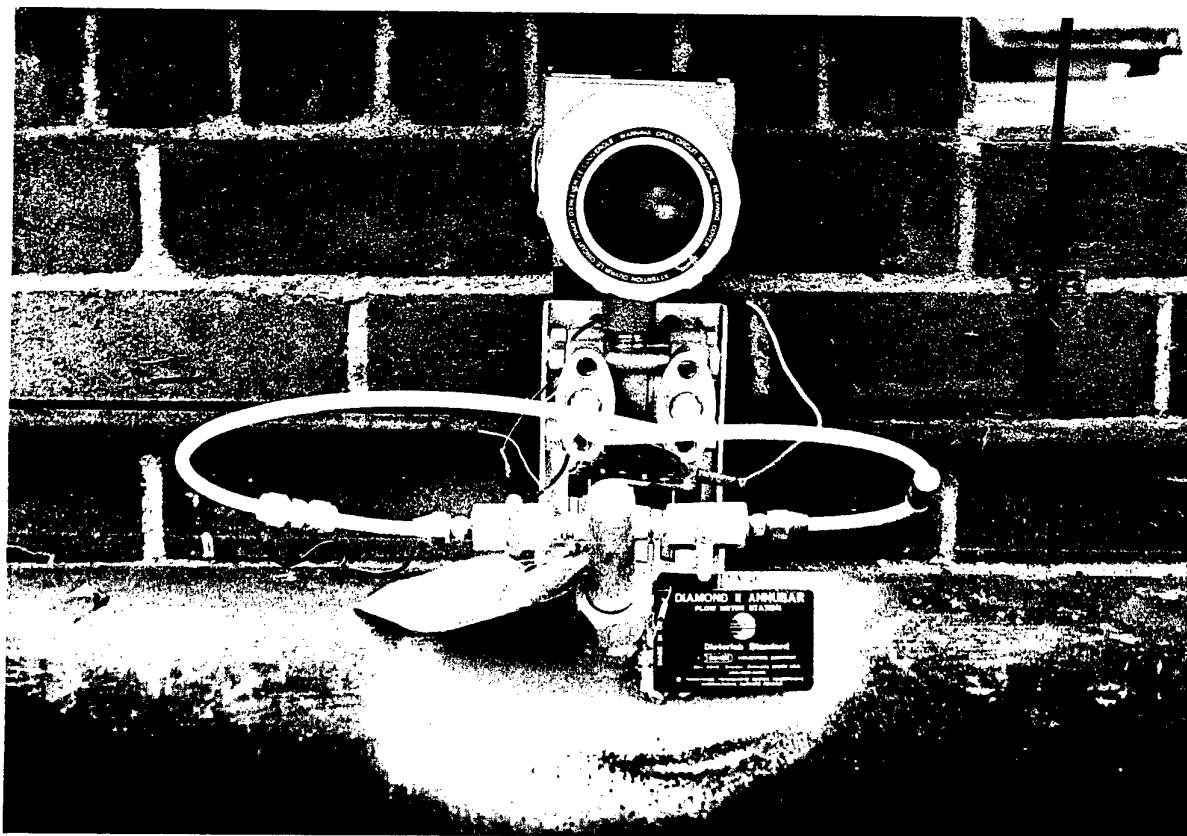
Figure 14. Differential pressure transducer and annubar
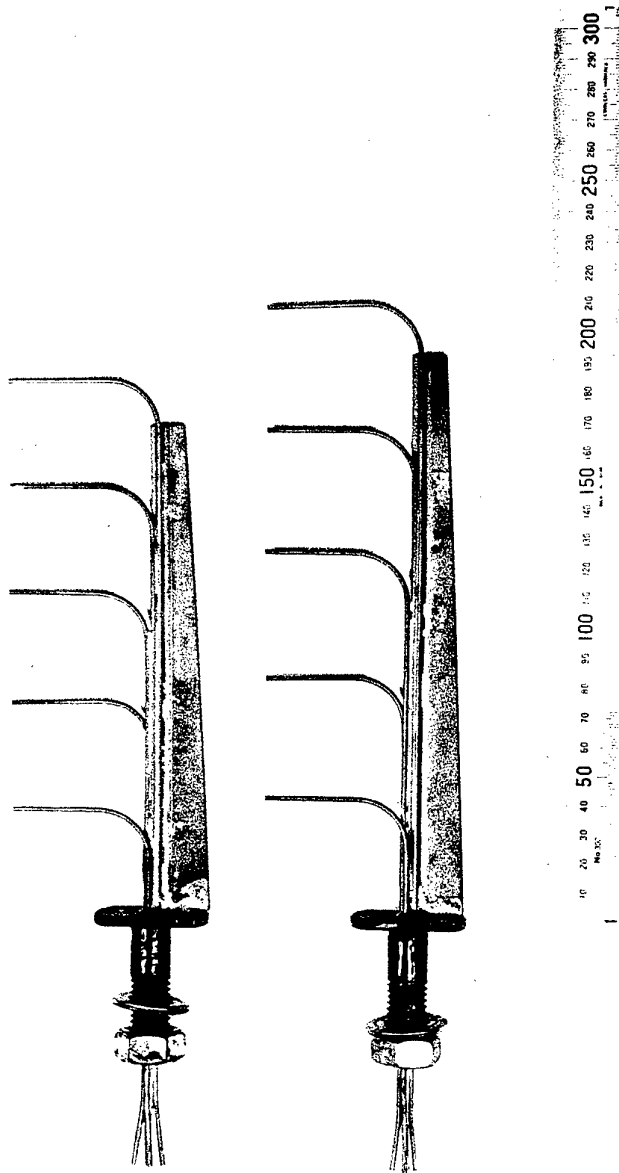
Figure 15. Compressor total pressure rakes

Inner Wall   259.5 mm (100%)

47.0 mm

#1   208.5 mm (80.3%)

#2   167.5 mm (64.5%)

#3   126.0 mm (48.6%)

#4   83.0 mm (32.0%)

#5   43.0 mm (16.5%)

Outer Wall   0 mm (0%)

Tube arrangement
(viewed from below)
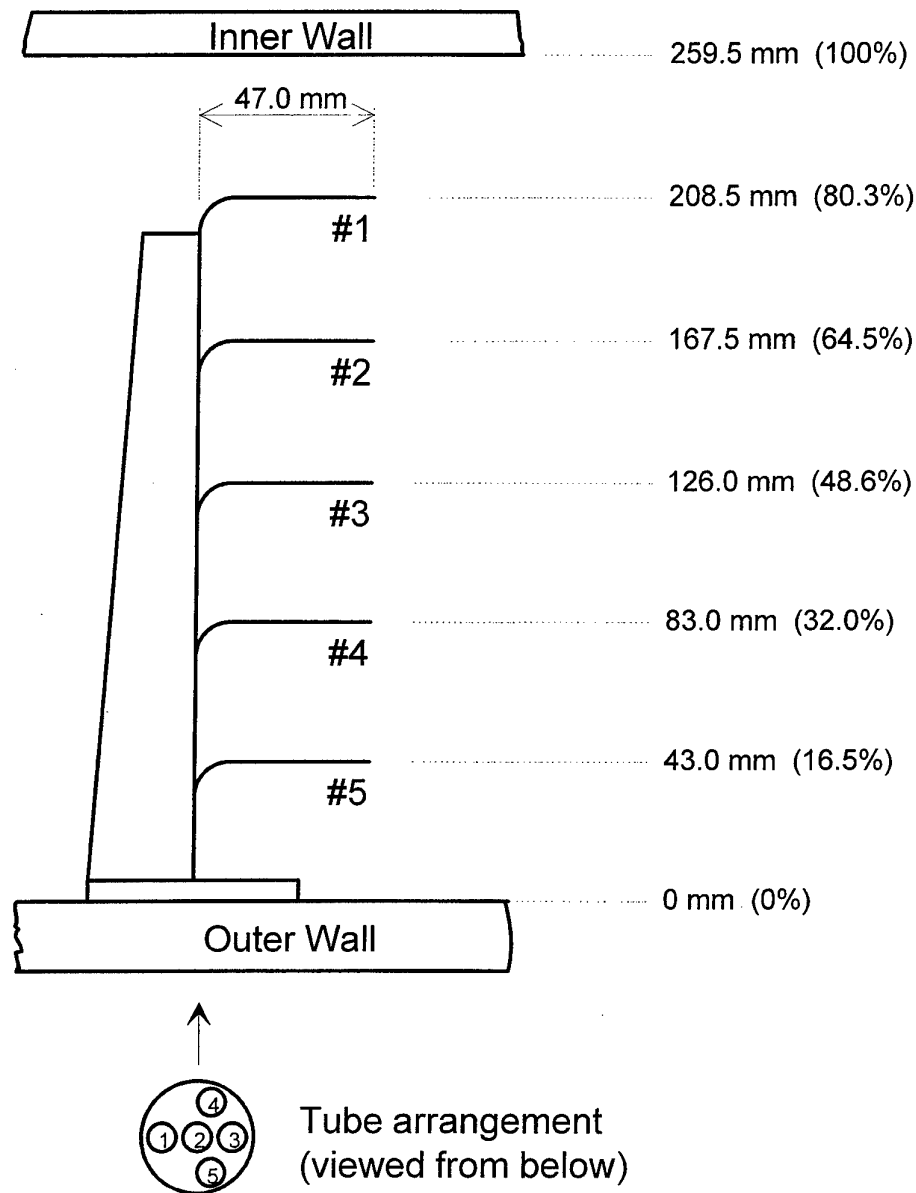
Figure 16. Total pressure rake #1 – Upstream of compressor

Inner Wall

221.5 mm (100%)

47.0 mm

#1
184.0 mm (83.1%)

#2
147.0 mm (66.4%)

#3
111.5 mm (50.3%)

#4
74.0 mm (33.4%)

#5
37.0 mm (16.7%)

0 mm (0%)

Outer Wall

Tube arrangement
(viewed from below)
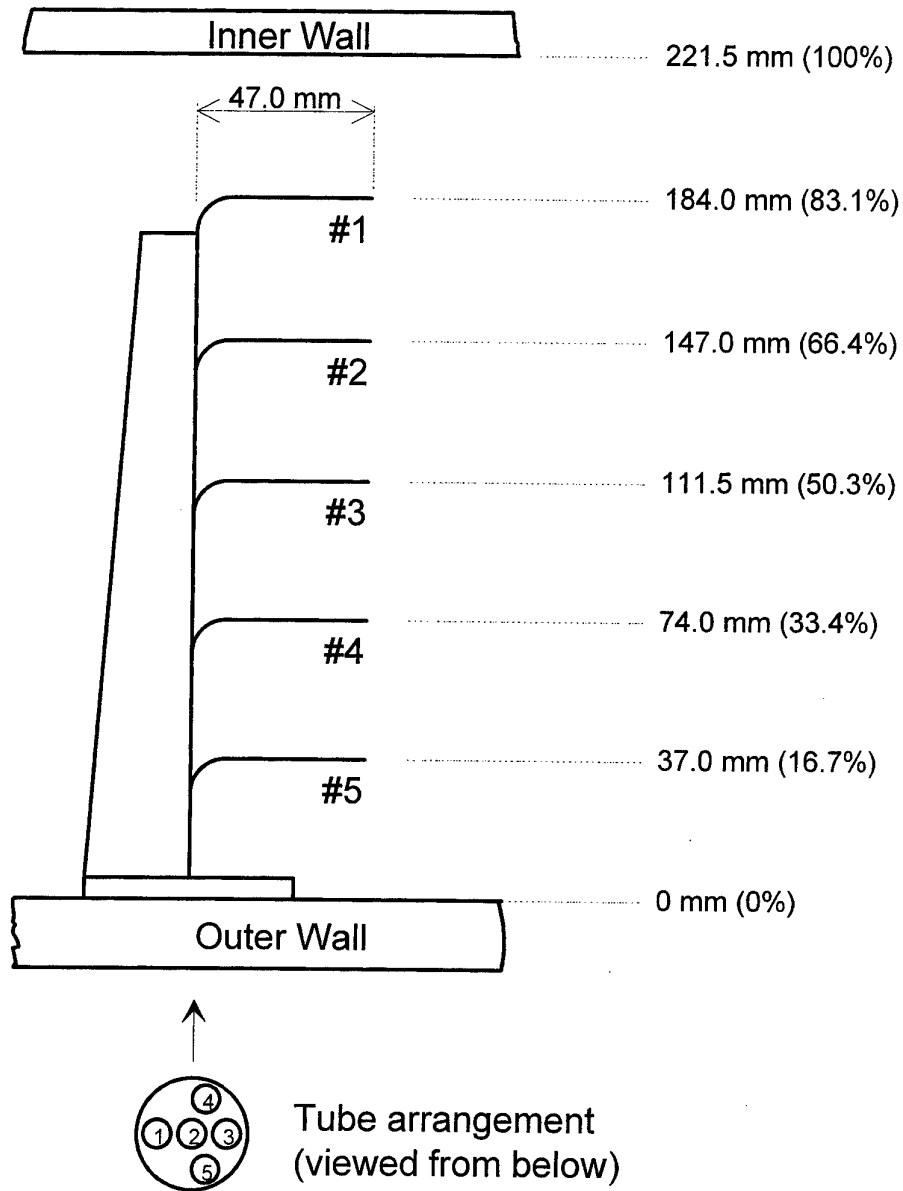
Figure 17. Total pressure rake #2 – Downstream of compressor
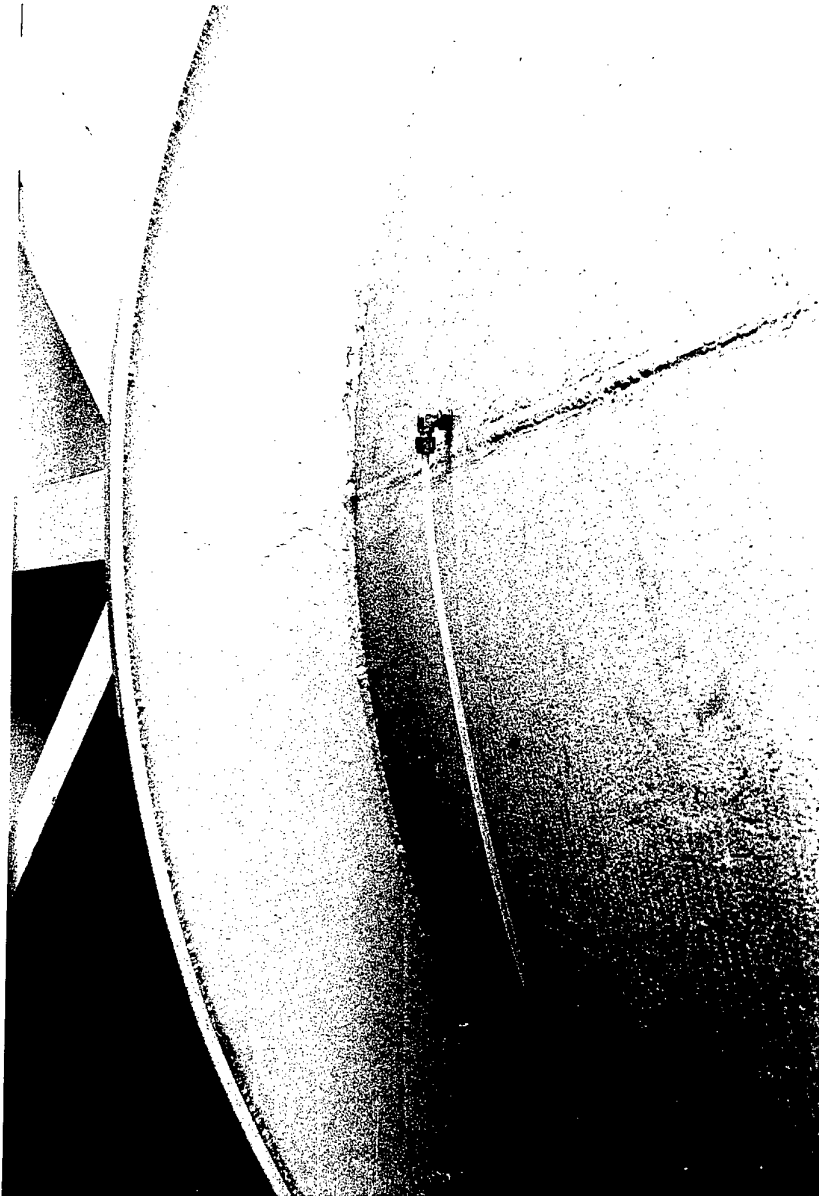
Figure 18. Static pressure hole fitting
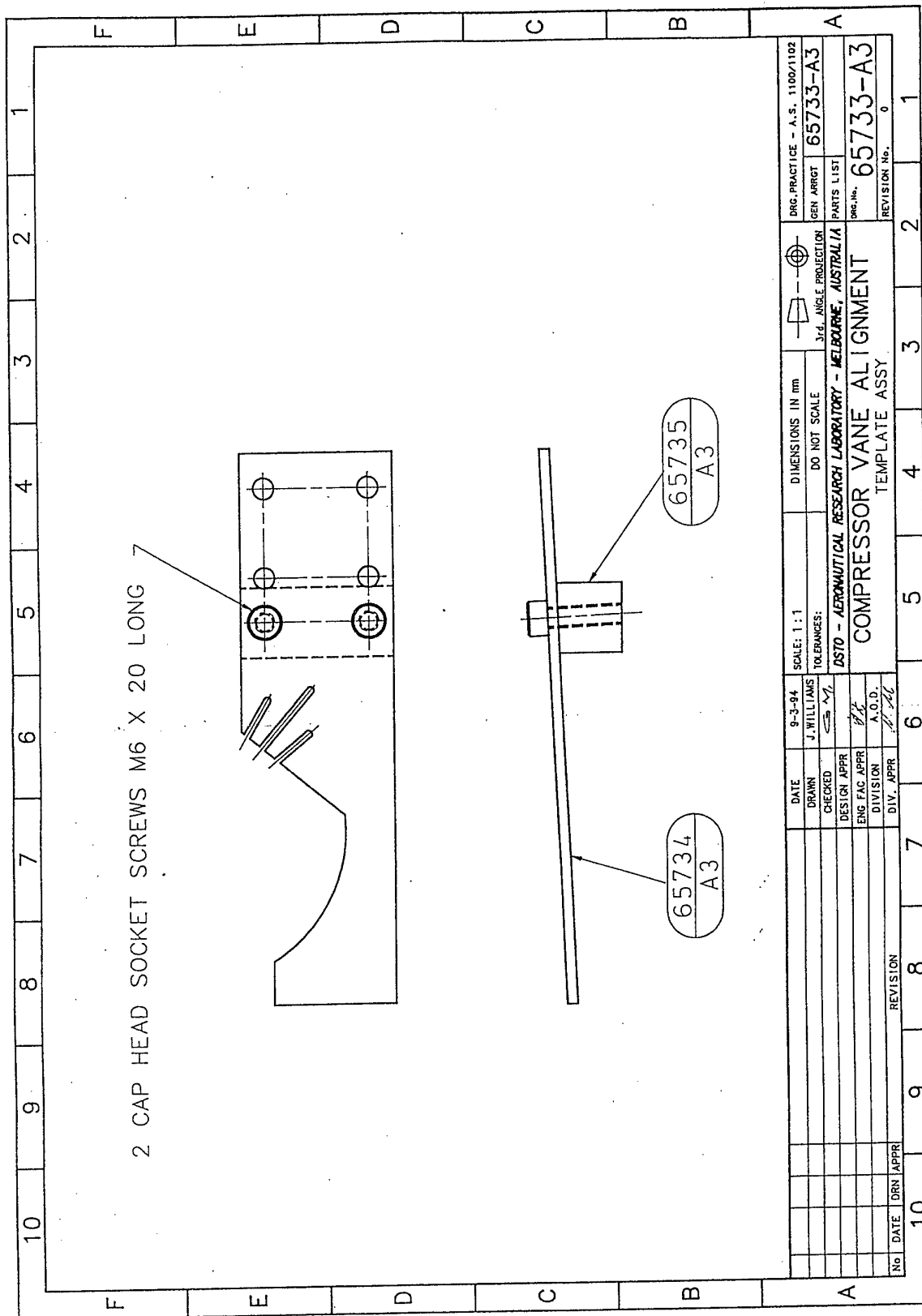
Figure 19. Blade stagger angle setting tool
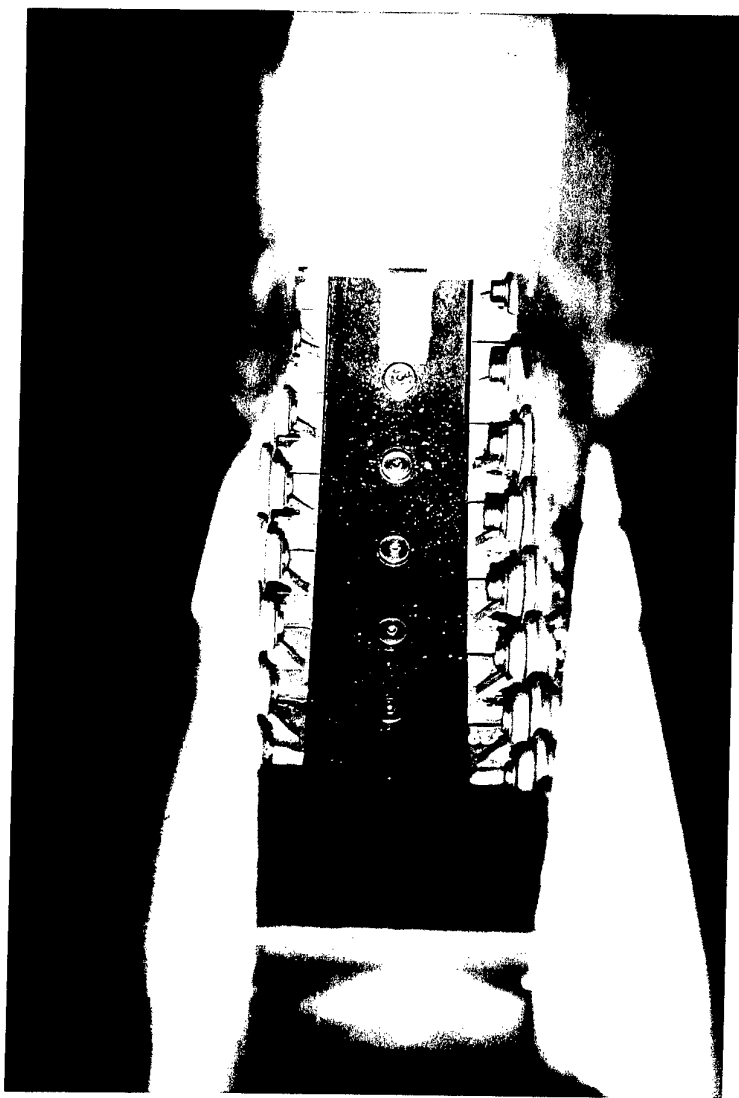
Figure 20a. Stator blade leading edge protrusion
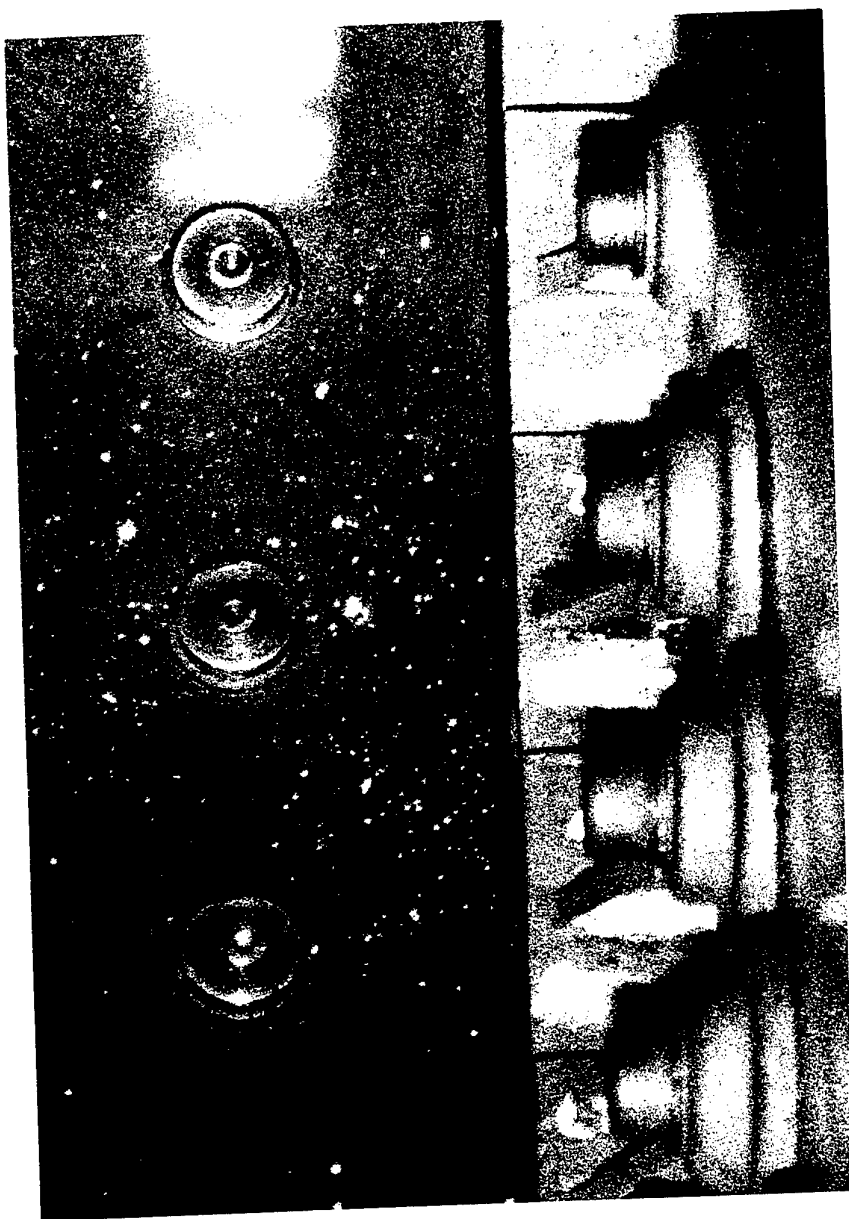
Figure 20b. Stator blade leading edge protrusion

Figure 21. Sound level measurement locations

1 - Main Gate (North)

2 - Car Park (East)

3 - Building 27 (South)

4 - Car Park (West)
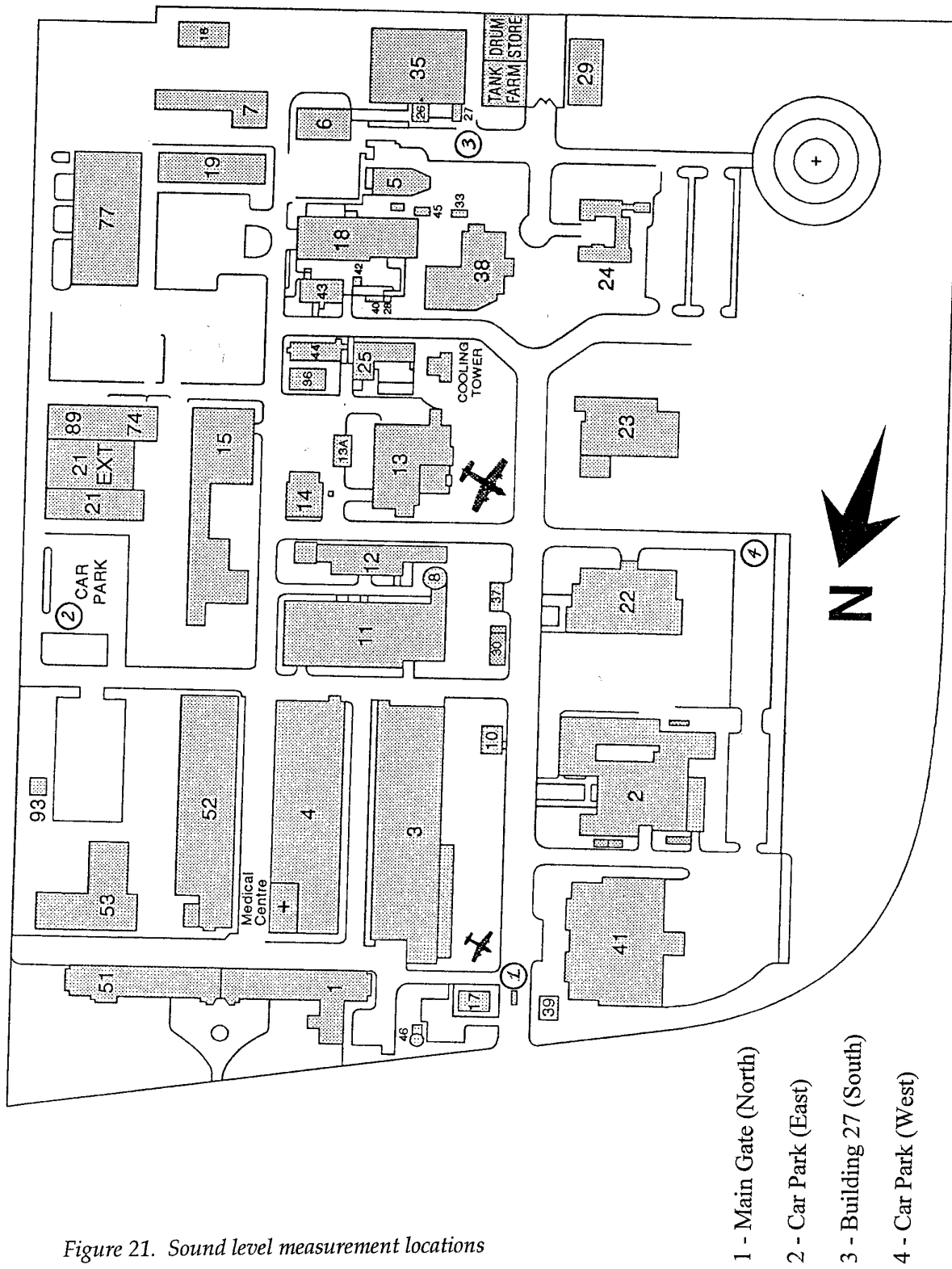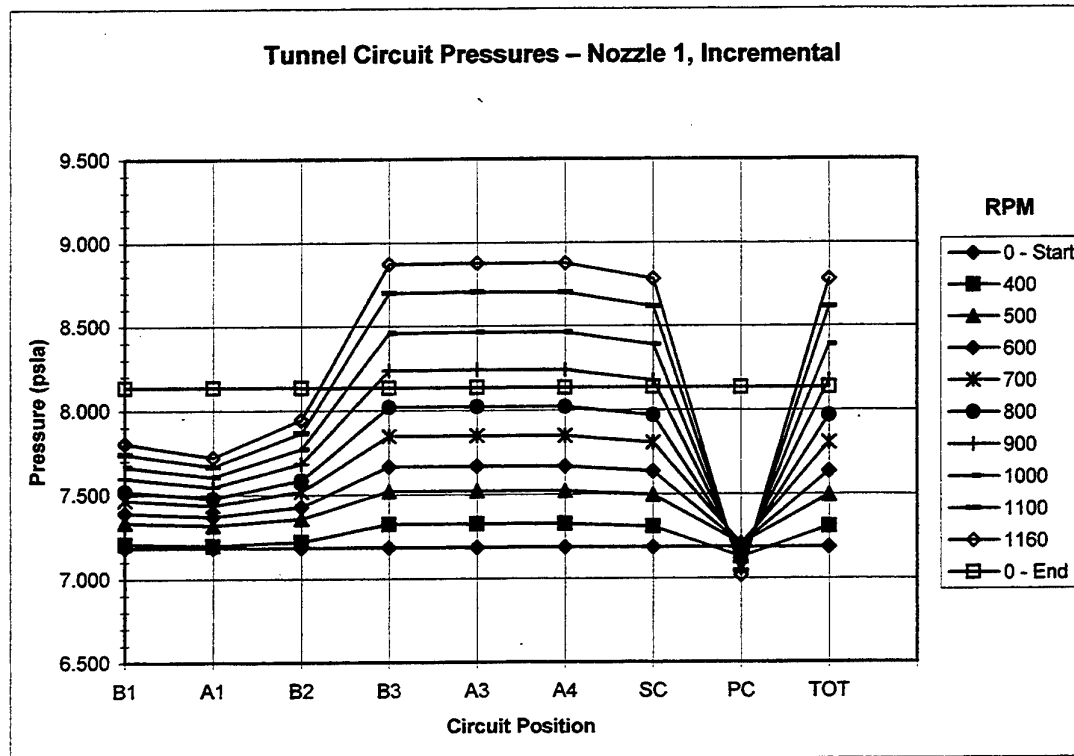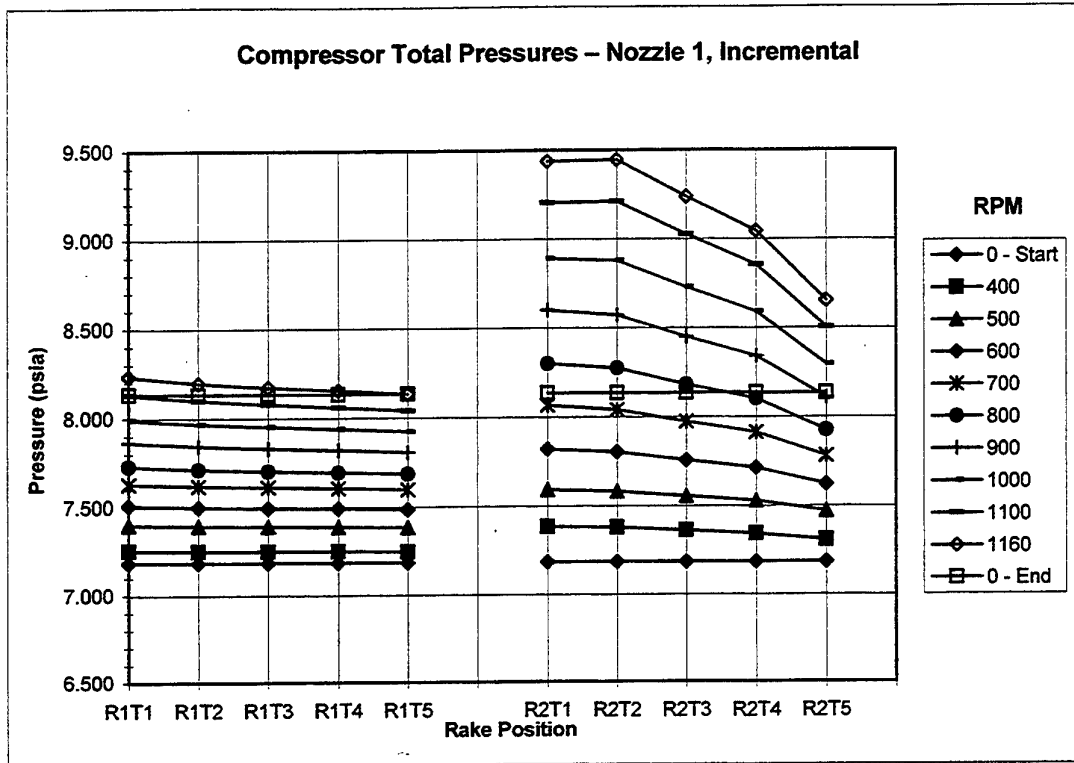
Figure 22. Pressure measurement for Nozzle 1 near the compressor and around the tunnel circuit
for a range of compressor speeds

35
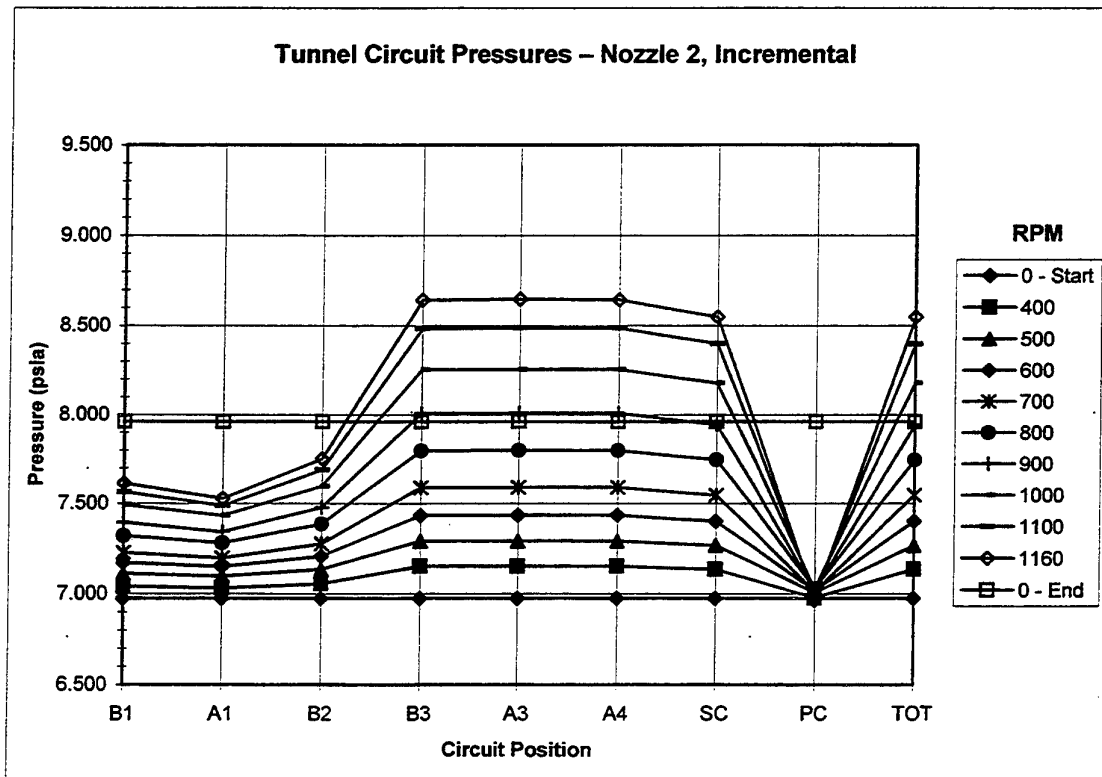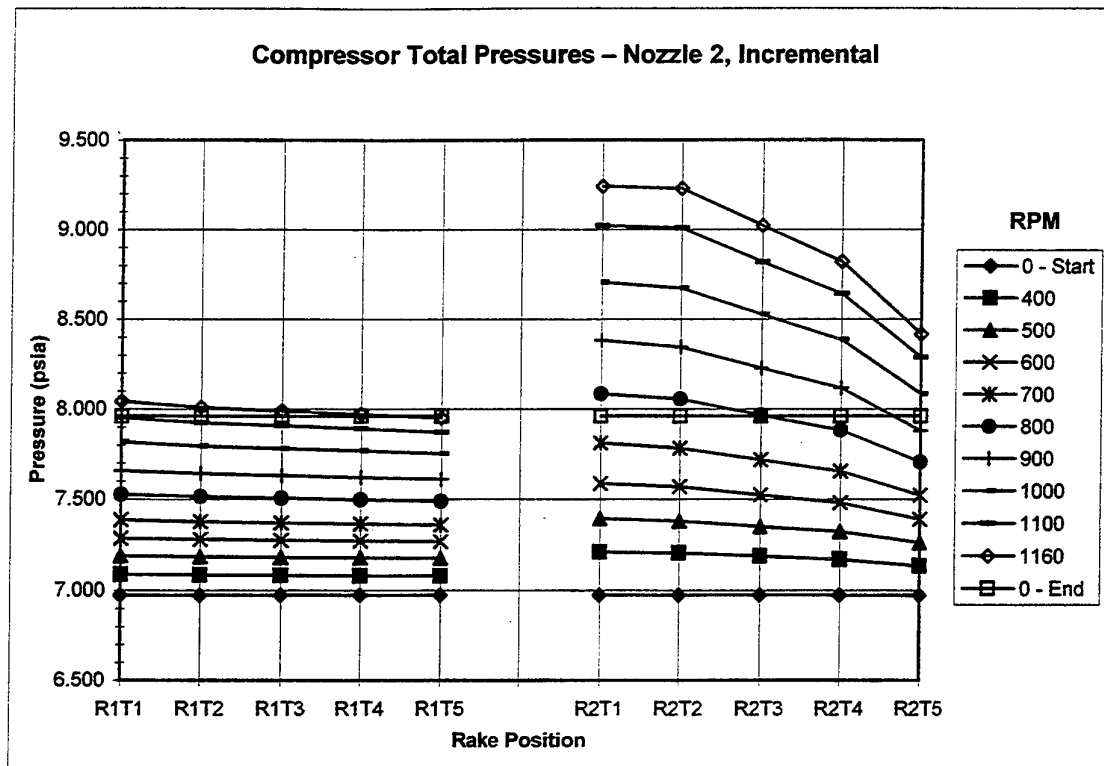
Figure 23. Pressure measurement for Nozzle 2 near the compressor and around the tunnel circuit for a range of compressor speeds
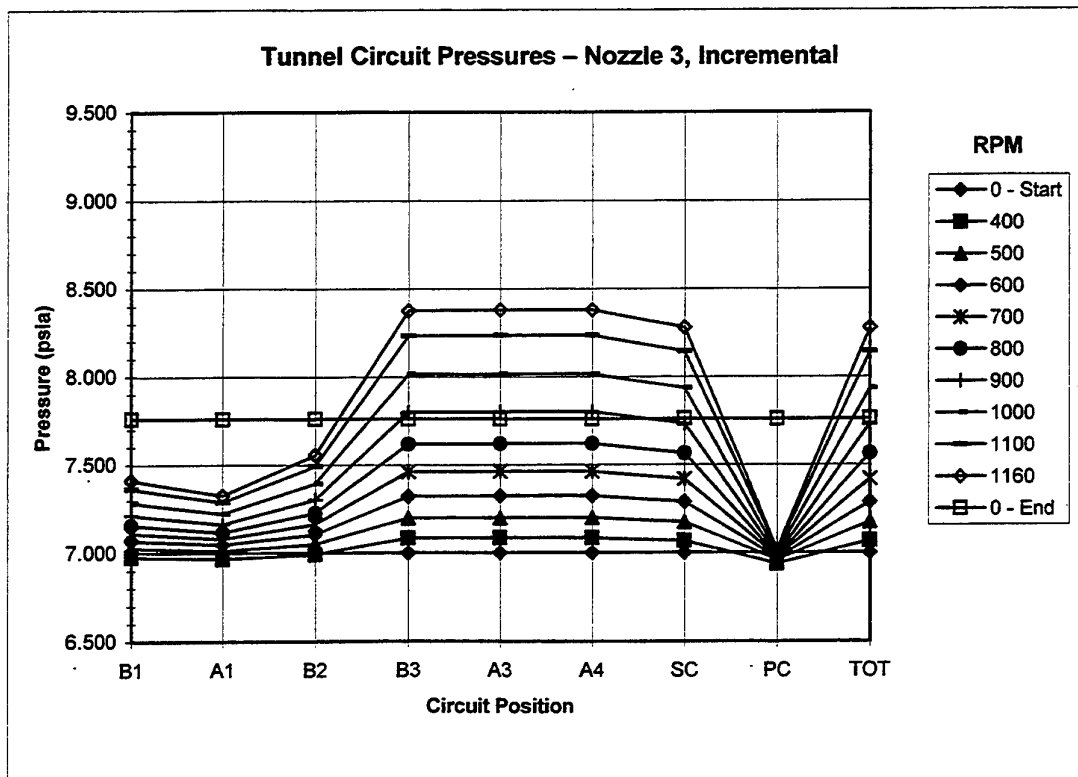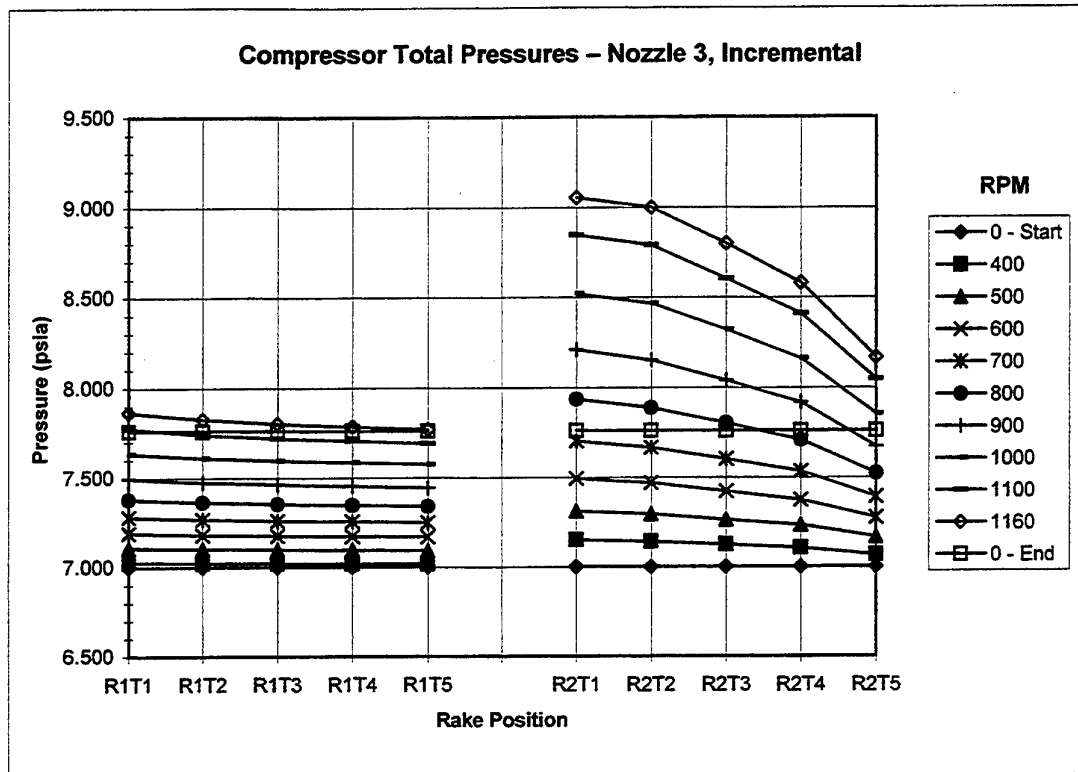
Figure 24. Pressure measurement for Nozzle 3 near the compressor and around the tunnel circuit for a range of compressor speeds
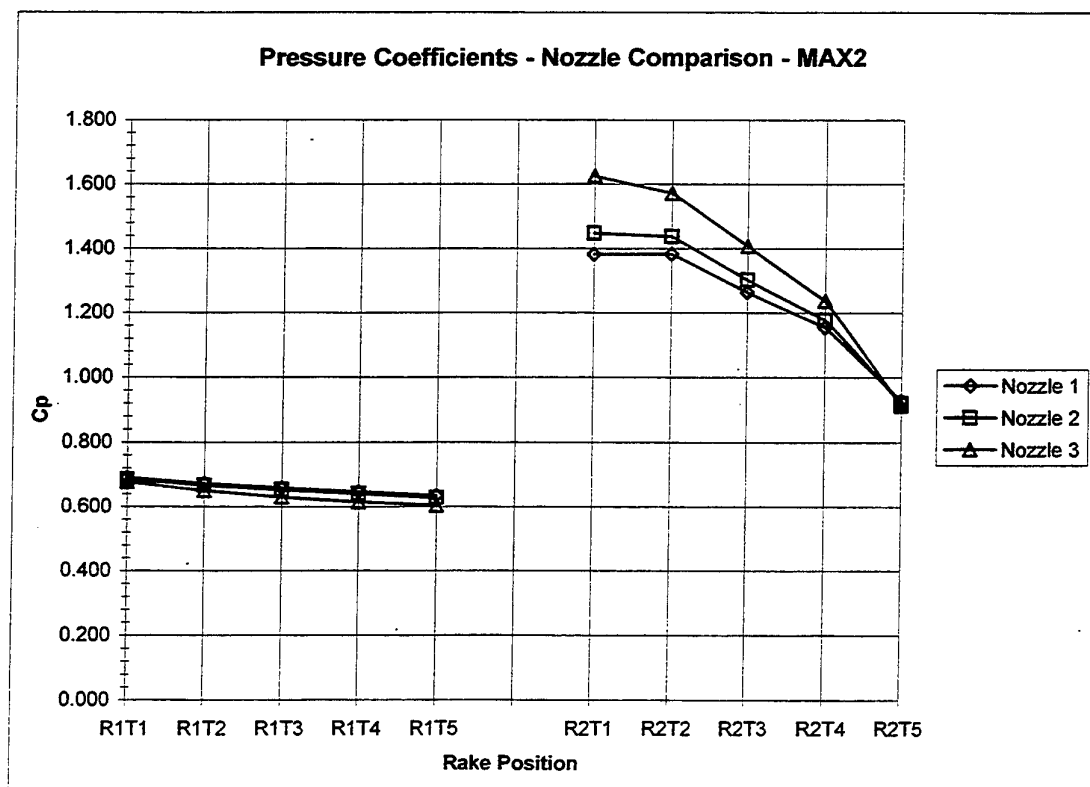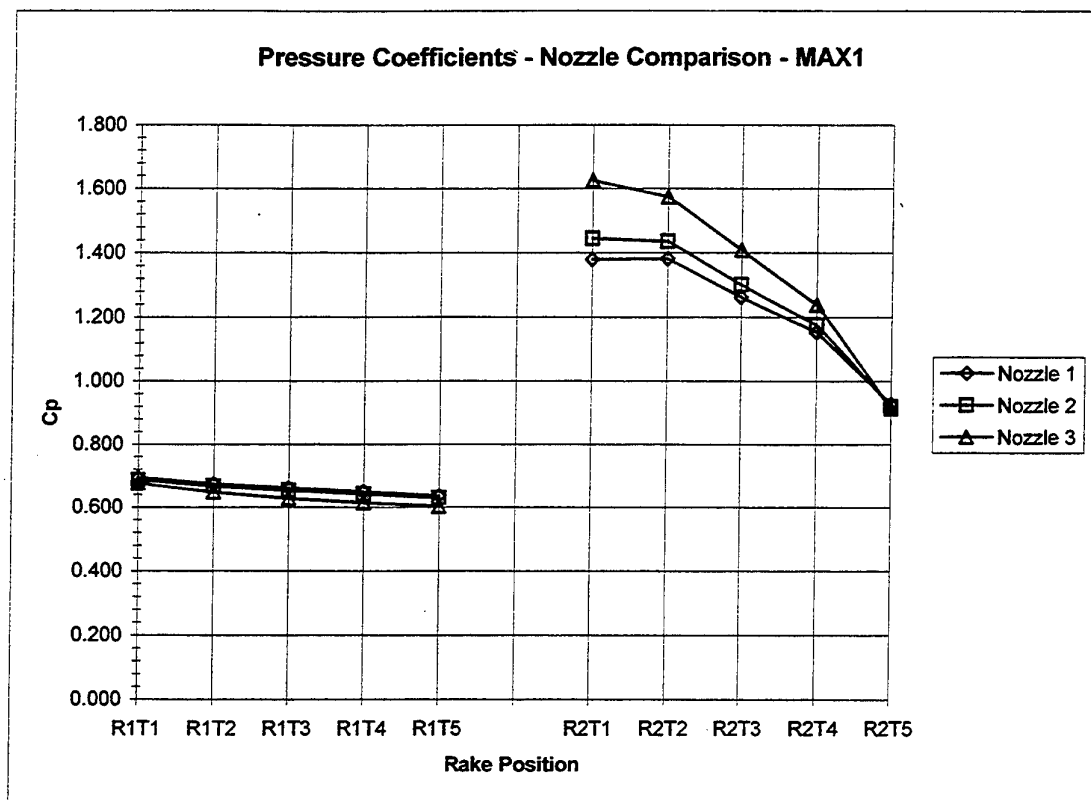
Figure 25. Nozzle comparison - Pressure coefficients near the compressor for the maximum compressor speed tests during the day (MAX1) and the night (MAX2)
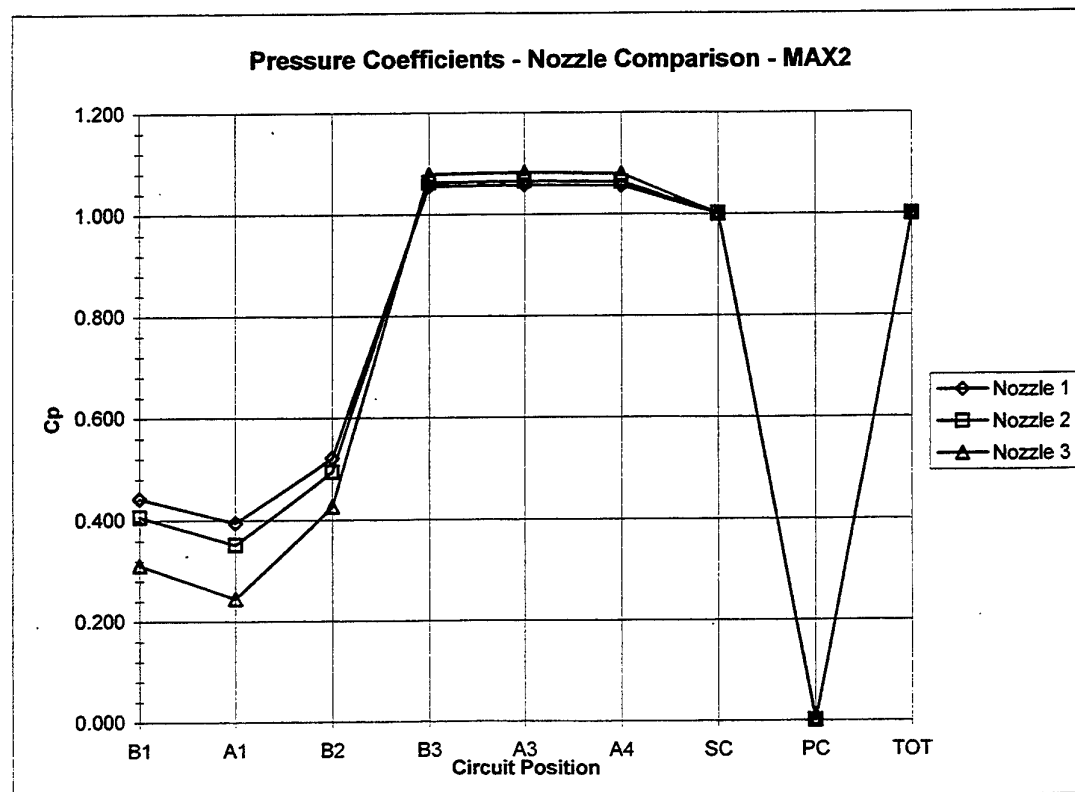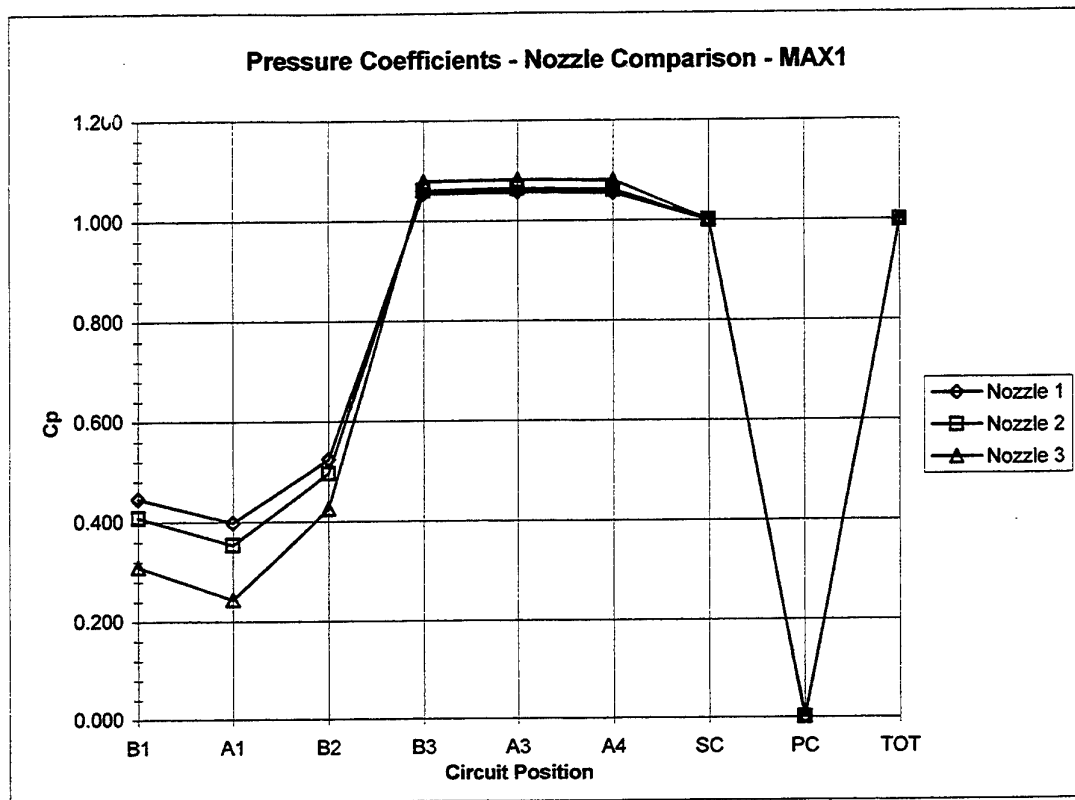
Figure 26. Nozzle comparison - Pressure coefficients around the circuit for the maximum compressor speed tests during the day (MAX1) and the night (MAX2)
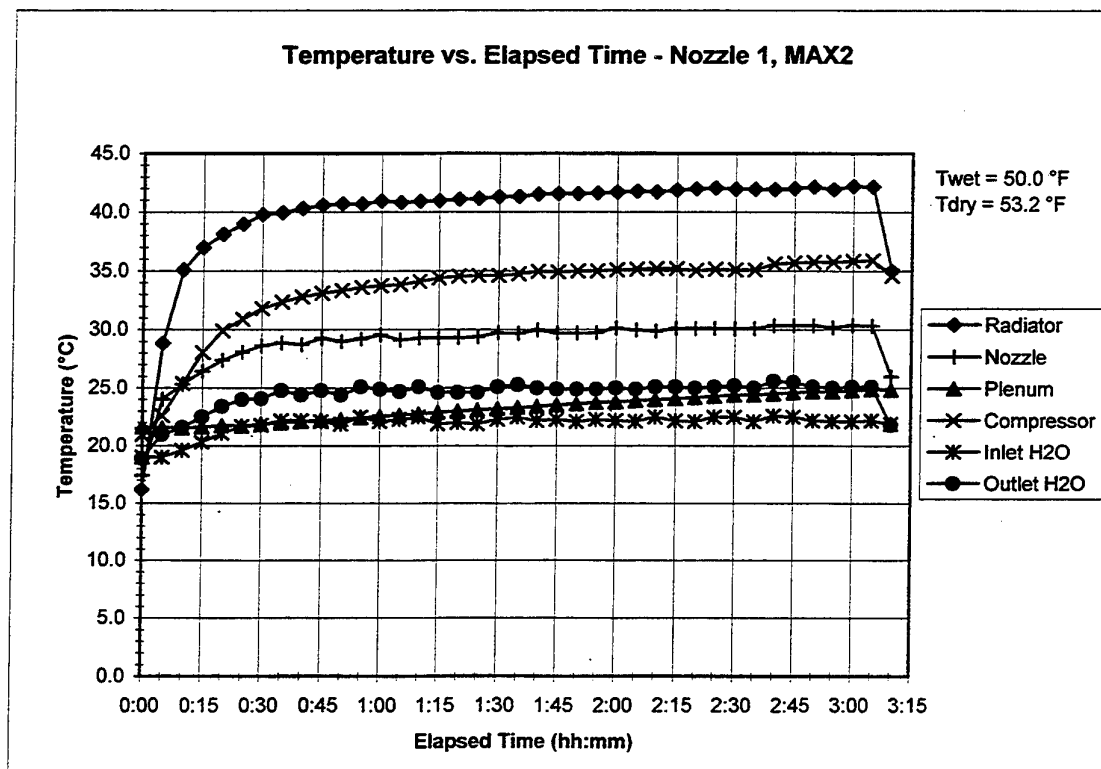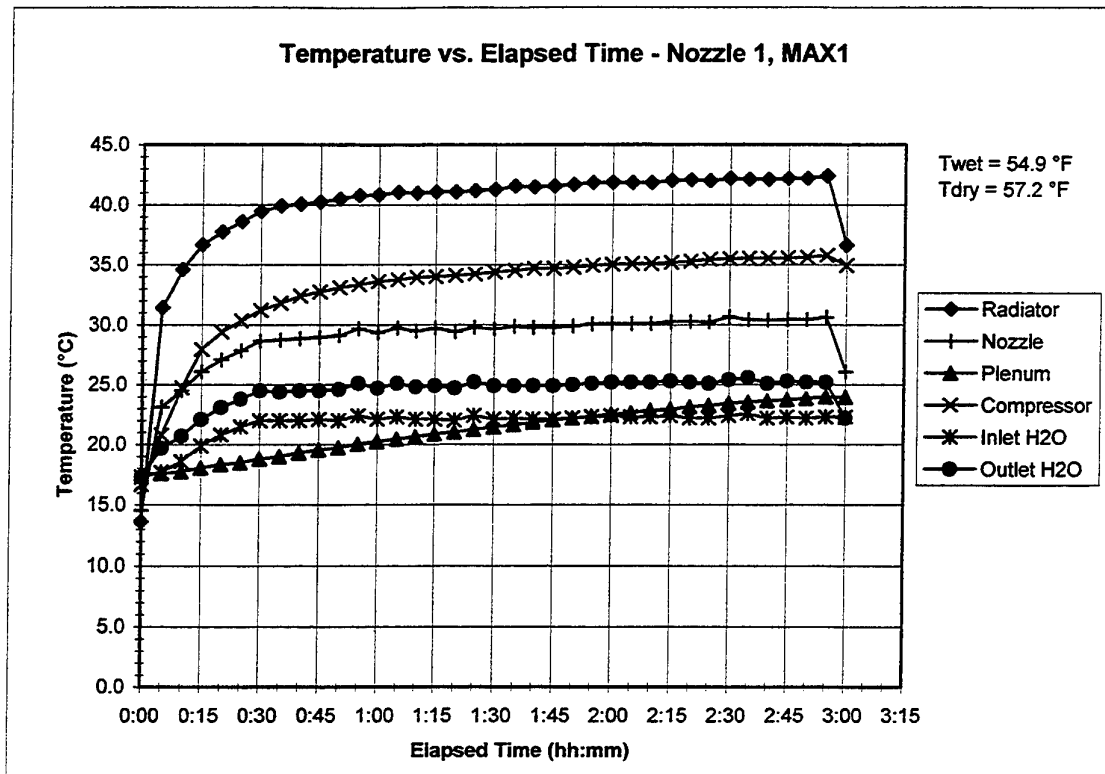
Figure 27. Nozzle 1 - Temperature variation for the maximum compressor speed tests during the day (MAX1) and the night (MAX2)
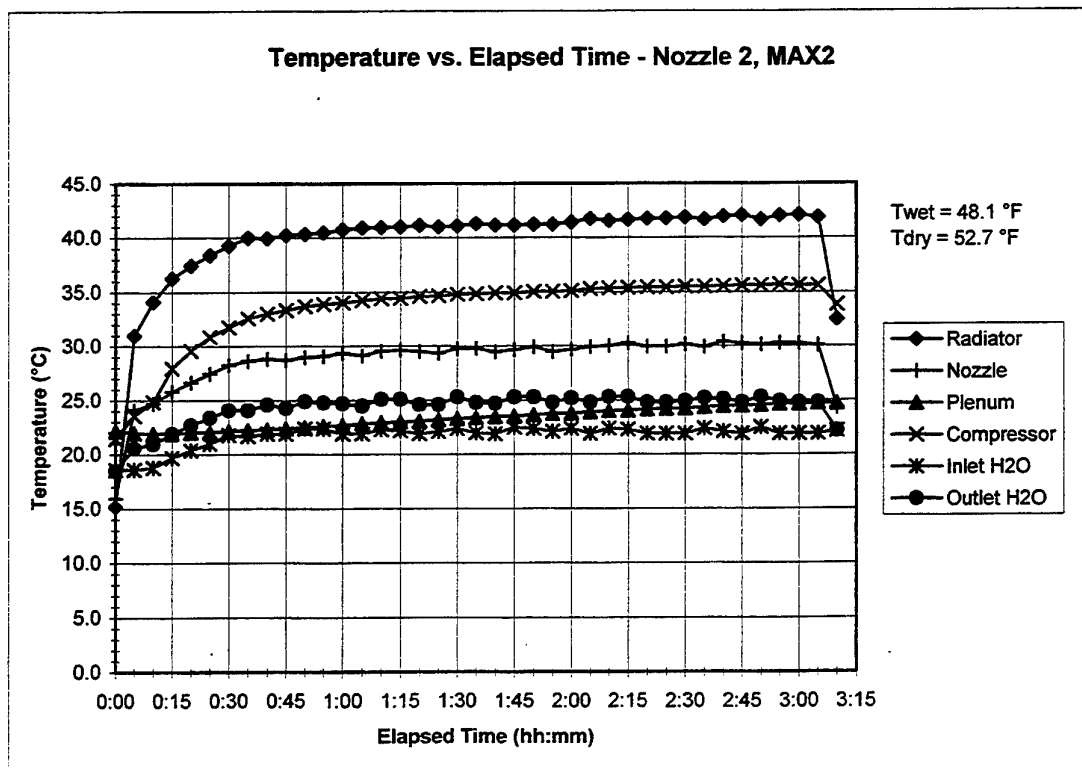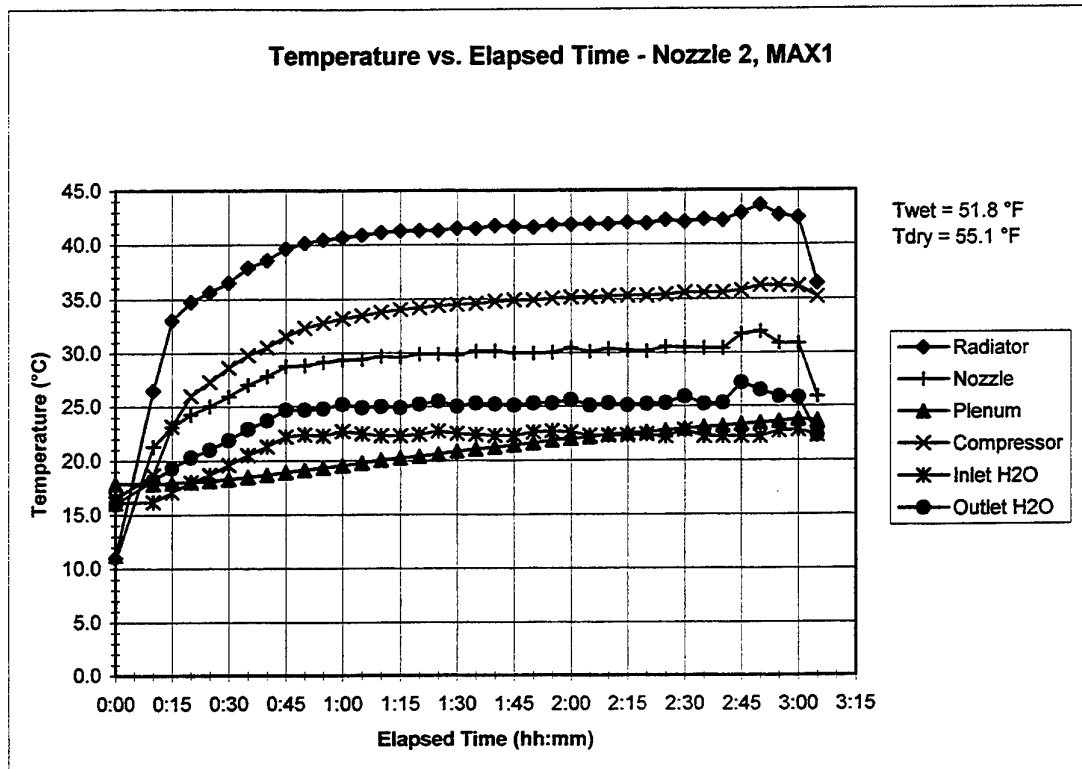
Figure 28. Nozzle 2 - Temperature variation for the maximum compressor speed tests during the day (MAX1) and the night (MAX2)
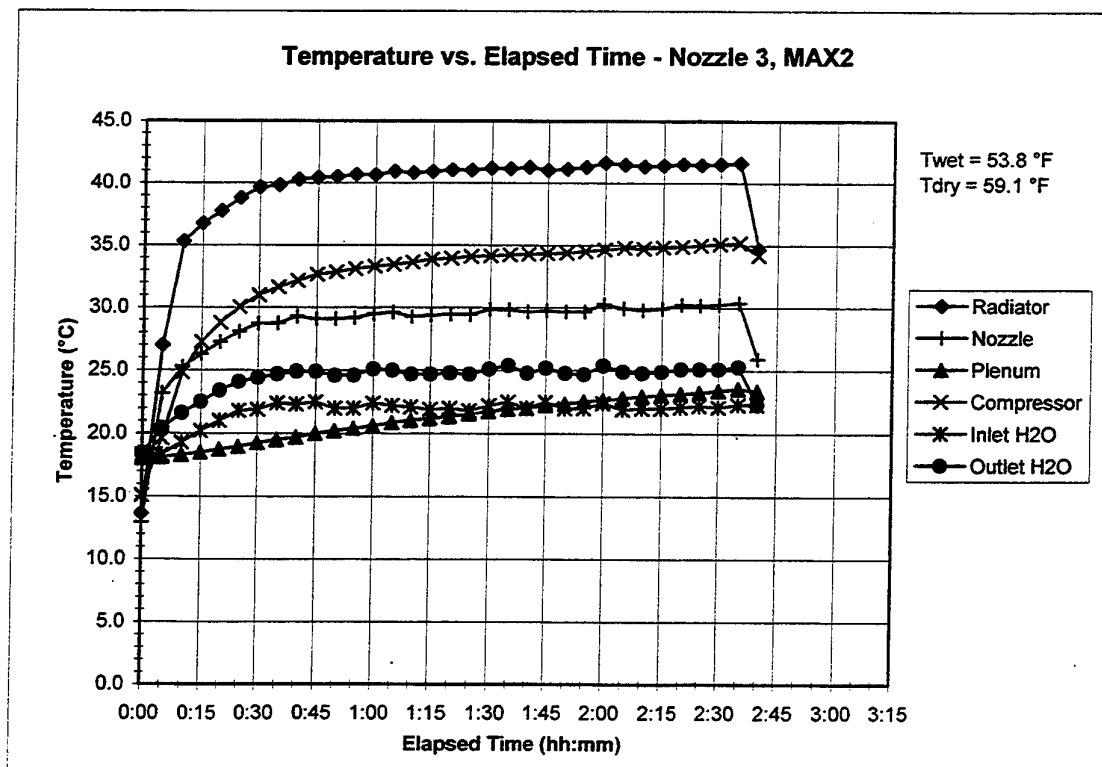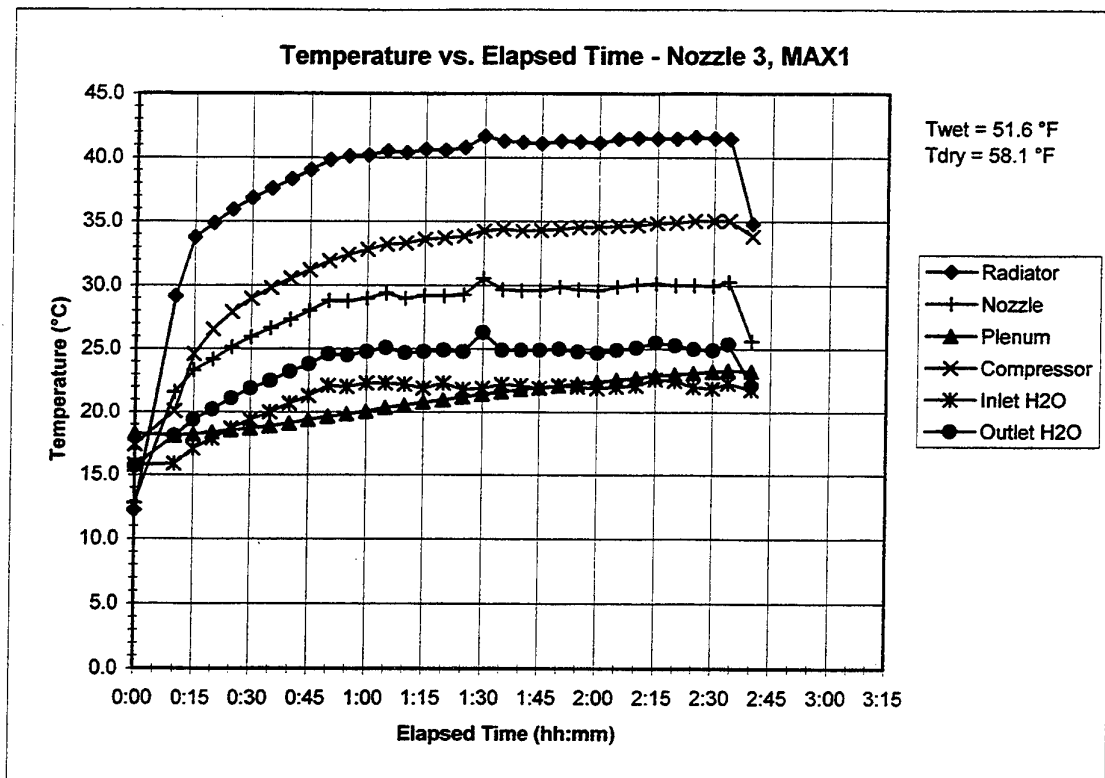
Figure 29. Nozzle 3 - Temperature variation for the maximum compressor speed tests during the
day (MAX1) and the night (MAX2)
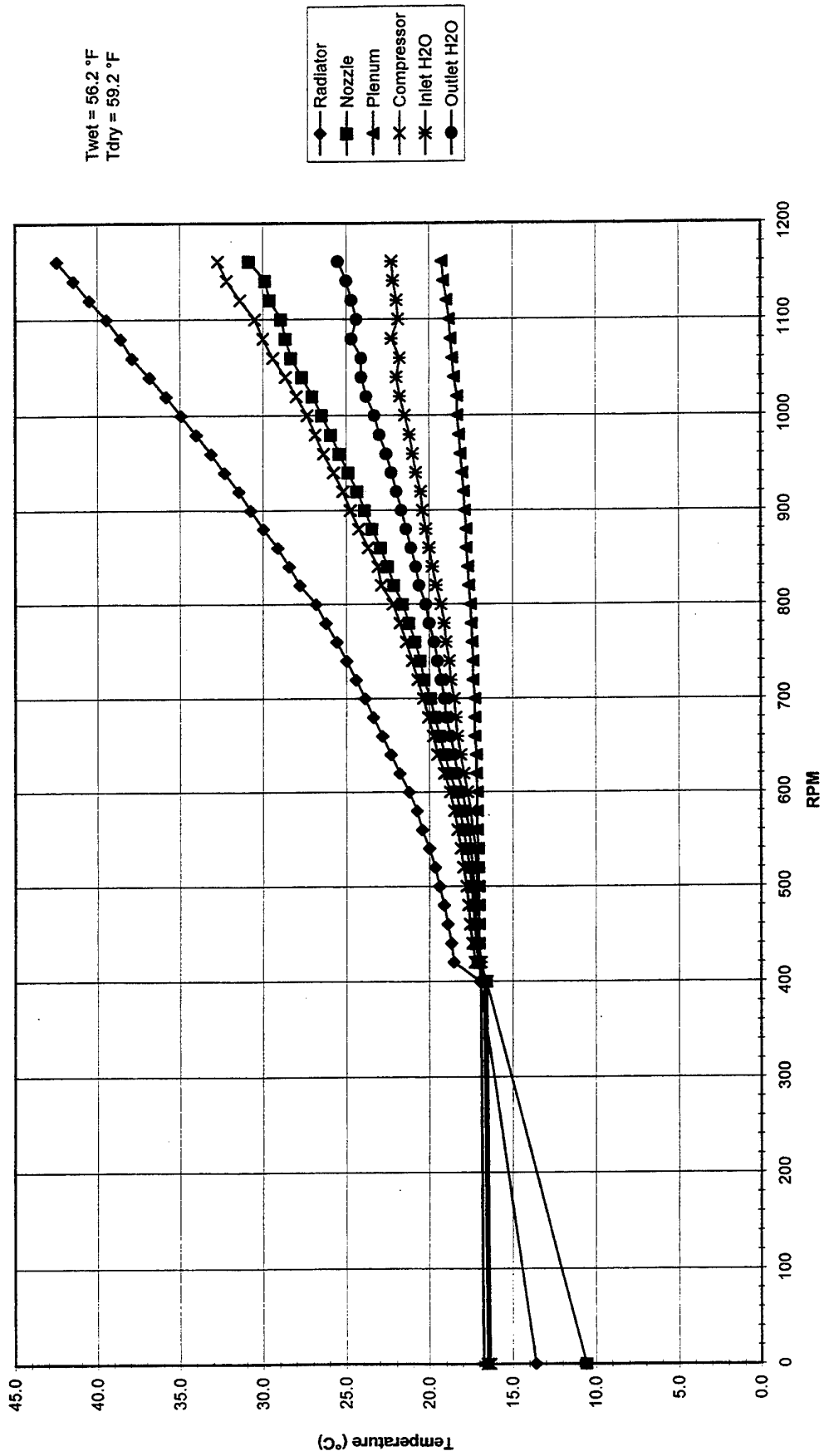
Figure 30. Nozzle 1 - Temperature variation with compressor speed for the Incremental test

APPENDIX A – Tabulated Data

A.1 Pressure Data – Nozzle 1 – Incremental (N1 INCR)

RPM=400 H=50.38 P=49.15   P (psi) = 7.128
Mon May 9 15:08:21 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.128	7.128
2	0.030	0.030	7.159	7.159
3	0.128	0.080	7.257	7.208
4	0.125	0.070	7.253	7.198
5	0.123	0.094	7.251	7.222
6	0.122	0.197	7.251	7.325
7	0.119	0.198	7.248	7.326
8	0.257	0.197	7.385	7.325
9	0.252	0.180	7.380	7.308
10	0.235	-0.001	7.363	7.128
11	0.216	0.180	7.345	7.309
12	0.181		7.309	

RPM=420 H=51.03 P=49.66   P (psi) = 7.202
Mon May 9 15:22:14 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.202	7.202
2	0.030	0.030	7.232	7.232
3	0.140	0.087	7.342	7.289
4	0.136	0.076	7.339	7.278
5	0.134	0.102	7.336	7.304
6	0.133	0.214	7.335	7.416
7	0.130	0.214	7.332	7.417
8	0.280	0.214	7.482	7.416
9	0.274	0.196	7.477	7.398
10	0.255	-0.001	7.457	7.202
11	0.235	0.196	7.437	7.399
12	0.195		7.398	

RPM=440 H=51.23 P=49.69 P (psi) = 7.207
Mon May 9 15:25:55 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.206	7.206
2	0.030	0.030	7.237	7.236
3	0.159	0.098	7.366	7.305
4	0.154	0.086	7.361	7.293
5	0.152	0.116	7.359	7.322
6	0.150	0.241	7.357	7.447
7	0.147	0.242	7.354	7.448
8	0.317	0.242	7.524	7.448
9	0.310	0.222	7.517	7.429
10	0.288	0.000	7.494	7.206
11	0.266	0.222	7.472	7.429
12	0.220		7.427	

RPM=460 H=51.40 P=49.73 P (psi) = 7.212
Mon May 9 15:29:04 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.212	7.212
2	0.030	0.030	7.243	7.242
3	0.175	0.107	7.387	7.320
4	0.170	0.095	7.382	7.307
5	0.167	0.127	7.379	7.340
6	0.166	0.264	7.378	7.476
7	0.162	0.264	7.374	7.477
8	0.349	0.264	7.562	7.477
9	0.340	0.243	7.553	7.456
10	0.315	-0.001	7.528	7.212
11	0.291	0.243	7.503	7.456
12	0.239		7.452	

RPM=480 H=51.54 P=49.71 P (psi) = 7.210
Mon May 9 15:31:03 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.210	7.209
2	0.030	0.030	7.240	7.240
3	0.191	0.118	7.401	7.327
4	0.186	0.104	7.395	7.314
5	0.182	0.140	7.392	7.349
6	0.180	0.289	7.390	7.499
7	0.176	0.290	7.386	7.500
8	0.382	0.290	7.592	7.499
9	0.372	0.267	7.582	7.477
10	0.344	0.000	7.554	7.209
11	0.319	0.267	7.528	7.477
12	0.263		7.472	

RPM=500 H=51.69 P=49.69 P (psi) = 7.207
Mon May 9 15:33:14 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.207	7.206
2	0.030	0.030	7.237	7.237
3	0.207	0.128	7.414	7.335
4	0.202	0.113	7.408	7.319
5	0.198	0.152	7.405	7.358
6	0.195	0.313	7.402	7.520
7	0.192	0.314	7.398	7.521
8	0.416	0.314	7.623	7.521
9	0.404	0.290	7.611	7.497
10	0.374	-0.001	7.581	7.206
11	0.346	0.290	7.553	7.497
12	0.285		7.492	

RPM=520 H=51.85 P=49.67 P (psi) = 7.204
Mon May 9 15:36:01 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.204	7.203
2	0.030	0.030	7.234	7.234
3	0.226	0.140	7.430	7.344
4	0.220	0.124	7.424	7.327
5	0.216	0.166	7.420	7.370
6	0.213	0.342	7.417	7.545
7	0.209	0.342	7.413	7.546
8	0.454	0.342	7.658	7.546
9	0.441	0.316	7.645	7.520
10	0.407	-0.001	7.611	7.203
11	0.377	0.316	7.581	7.520
12	0.310		7.514	

RPM=540 H=52.03 P=49.66 P (psi) = 7.202
Mon May 9 15:38:03 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.202	7.202
2	0.030	0.030	7.233	7.232
3	0.245	0.152	7.447	7.354
4	0.239	0.134	7.442	7.336
5	0.234	0.180	7.436	7.382
6	0.231	0.370	7.433	7.572
7	0.226	0.371	7.429	7.574
8	0.493	0.371	7.695	7.573
9	0.479	0.343	7.681	7.546
10	0.442	-0.001	7.644	7.202
11	0.408	0.343	7.610	7.546
12	0.334		7.536	

RPM=560	H=52.20	P=49.63	P (psi) =	7.198
Mon	May		9 15:40:28	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	7.198	7.197
2	0.030	0.030	7.228	7.228
3	0.266	0.164	7.463	7.362
4	0.259	0.145	7.457	7.343
5	0.254	0.196	7.452	7.393
6	0.250	0.399	7.448	7.597
7	0.246	0.401	7.444	7.599
8	0.533	0.401	7.731	7.599
9	0.518	0.372	7.716	7.570
10	0.478	-0.001	7.676	7.197
11	0.442	0.371	7.640	7.569
12	0.362		7.560	

RPM=580	H=52.38	P=49.62	P (psi) =	7.197
Mon	May		9 15:42:41	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	7.196	7.196
2	0.030	0.030	7.227	7.226
3	0.286	0.178	7.483	7.374
4	0.279	0.157	7.476	7.354
5	0.274	0.211	7.470	7.408
6	0.270	0.432	7.467	7.629
7	0.264	0.434	7.461	7.630
8	0.575	0.434	7.772	7.630
9	0.560	0.403	7.757	7.599
10	0.517	0.000	7.713	7.196
11	0.477	0.402	7.674	7.599
12	0.391		7.588	

RPM=600	H=52.63	P=49.66	P (psi) =	7.202
Mon	May		9 15:46:11	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.202	7.202
2	0.030	0.030	7.233	7.232
3	0.307	0.191	7.509	7.393
4	0.299	0.169	7.501	7.371
5	0.293	0.226	7.496	7.429
6	0.290	0.464	7.492	7.666
7	0.284	0.465	7.486	7.668
8	0.618	0.464	7.821	7.667
9	0.601	0.433	7.803	7.635
10	0.554	0.000	7.756	7.202
11	0.511	0.432	7.714	7.635
12	0.420		7.622	

RPM=620	H=52.85	P=49.66	P (psi) =	7.202
Mon	May		9 15:49:00	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.202	7.202
2	0.030	0.030	7.233	7.233
3	0.330	0.205	7.532	7.407
4	0.321	0.181	7.523	7.384
5	0.315	0.243	7.517	7.445
6	0.311	0.498	7.513	7.700
7	0.304	0.499	7.507	7.701
8	0.665	0.499	7.867	7.701
9	0.646	0.465	7.848	7.667
10	0.595	0.000	7.797	7.202
11	0.549	0.464	7.751	7.666
12	0.448		7.651	

RPM=640	H=53.08	P=49.66	P (psi) =	7.202
Mon	May		9 15:52:00	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.203	7.202
2	0.030	0.030	7.233	7.232
3	0.354	0.221	7.556	7.423
4	0.344	0.195	7.546	7.398
5	0.337	0.261	7.539	7.463
6	0.332	0.533	7.534	7.735
7	0.325	0.535	7.527	7.738
8	0.712	0.535	7.915	7.737
9	0.692	0.498	7.894	7.700
10	0.637	0.000	7.840	7.202
11	0.588	0.498	7.790	7.700
12	0.479		7.681	

RPM=660	H=53.31	P=49.62	P (psi) =	7.197
Mon	May		9 15:54:35	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.197	7.196
2	0.030	0.030	7.227	7.227
3	0.379	0.237	7.575	7.433
4	0.368	0.210	7.565	7.406
5	0.361	0.281	7.558	7.477
6	0.356	0.572	7.552	7.769
7	0.349	0.574	7.546	7.771
8	0.764	0.574	7.960	7.771
9	0.743	0.535	7.939	7.732
10	0.683	0.000	7.879	7.196
11	0.630	0.535	7.826	7.732
12	0.514		7.710	

RPM=680	H=53.50	P=49.62	P (psi) =	7.197
Mon	May		9 15:56:52	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.197	7.196
2	0.030	0.030	7.227	7.227
3	0.399	0.249	7.596	7.446
4	0.389	0.221	7.585	7.417
5	0.381	0.295	7.578	7.492
6	0.375	0.603	7.572	7.800
7	0.370	0.605	7.566	7.802
8	0.808	0.605	8.004	7.801
9	0.784	0.565	7.981	7.761
10	0.722	0.000	7.919	7.196
11	0.666	0.564	7.862	7.761
12	0.543		7.739	

RPM=700	H=53.72	P=49.67	P (psi) =	7.204
Mon	May		9 15:59:12	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.204	7.204
2	0.030	0.030	7.234	7.234
3	0.426	0.266	7.630	7.470
4	0.416	· 0.235	7.620	7.439
5	0.409	0.315	7.613	7.519
6	0.403	0.643	7.607	7.847
7	0.395	0.645	7.598	7.849
8	0.863	0.644	8.067	7.848
9	0.837	0.603	8.040	7.806
10	0.770	0.000	7.974	7.204
11	0.709	0.602	7.913	7.806
12	0.576		7.780	

RPM=720 H=53.98 P=49.55 P (psi) = 7.186
Mon May 9 16:02:07 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.186	7.186
2	0.030	0.030	7.217	7.217
3	0.454	0.285	7.641	7.471
4	0.444	0.253	7.630	7.439
5	0.436	0.338	7.622	7.524
6	0.430	0.688	7.617	7.874
7	0.422	0.689	7.609	7.875
8	0.921	0.688	8.107	7.875
9	0.893	0.644	8.080	7.830
10	0.822	0.000	8.008	7.186
11	0.757	0.643	7.943	7.830
12	0.615		7.801	

RPM=740 H=54.17 P=49.50 P (psi) = 7.179
Mon May 9 16:04:07 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.179	7.179
2	0.030	0.030	7.210	7.210
3	0.478	0.299	7.657	7.478
4	0.465	0.266	7.644	7.445
5	0.455	0.355	7.634	7.534
6	0.447	0.723	7.627	7.902
7	0.439	0.725	7.618	7.904
8	0.964	0.724	8.143	7.903
9	0.940	0.678	8.119	7.857
10	0.864	0.000	8.043	7.179
11	0.795	0.677	7.974	7.856
12	0.647		7.827	

RPM=760 H=54.40 P=49.44 P (psi) = 7.170
Mon May 9 16:06:31 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.171	7.170
2	0.030	0.030	7.201	7.201
3	0.507	0.319	7.677	7.489
4	0.493	0.283	7.663	7.453
5	0.483	0.378	7.653	7.548
6	0.476	0.765	7.646	7.936
7	0.467	0.767	7.637	7.938
8	1.021	0.767	8.191	7.937
9	0.993	0.719	8.164	7.889
10	0.912	0.000	8.082	7.171
11	0.841	0.718	8.011	7.888
12	0.683		7.853	

RPM=780 H=54.67 P=49.40 P (psi) = 7.165
Mon May 9 16:09:01 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.165	7.164
2	0.031	0.031	7.195	7.195
3	0.538	0.339	7.702	7.504
4	0.524	0.301	7.689	7.466
5	0.515	0.402	7.680	7.567
6	0.507	0.814	7.672	7.979
7	0.499	0.816	7.663	7.981
8	1.085	0.815	8.250	7.980
9	1.059	0.765	8.223	7.930
10	0.971	0.000	8.135	7.165
11	0.895	0.764	8.059	7.929
12	0.727		7.892	

RPM=800 H=54.93 P=49.40 P (psi) = 7.165
Mon May 9 16:11:48 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.165	7.165
2	0.031	0.030	7.195	7.195
3	0.565	0.356	7.730	7.521
4	0.548	0.316	7.713	7.481
5	0.537	0.422	7.702	7.587
6	0.529	0.854	7.693	8.018
7	0.521	0.856	7.685	8.021
8	1.137	0.855	8.301	8.019
9	1.110	0.803	8.274	7.968
10	1.017	0.000	8.181	7.165
11	0.937	0.802	8.102	7.967
12	0.760		7.924	

RPM=820 H=55.27 P=49.41 P (psi) = 7.166
Mon May 9 16:15:51 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.167	7.166
2	0.031	0.030	7.197	7.196
3	0.600	0.380	7.766	7.546
4	0.583	0.339	7.750	7.505
5	0.571	0.450	7.737	7.616
6	0.562	0.906	7.728	8.072
7	0.553	0.909	7.719	8.075
8	1.206	0.908	8.372	8.074
9	1.178	0.853	8.344	8.019
10	1.080	0.000	8.246	7.166
11	0.995	0.852	8.161	8.018
12	0.805		7.971	

RPM=840 H=55.54 P=49.38 P (psi) = 7.162
Mon May 9 16:18:36 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.162	7.162
2	0.031	0.031	7.193	7.192
3	0.632	0.400	7.794	7.562
4	0.614	0.355	7.776	7.517
5	0.601	0.473	7.762	7.635
6	0.591	0.951	7.753	8.113
7	0.581	0.954	7.743	8.116
8	1.266	0.953	8.428	8.115
9	1.238	0.896	8.400	8.058
10	1.134	0.000	8.296	7.162
11	1.044	0.895	8.205	8.057
12	0.843		8.005	

RPM=860 H=55.82 P=49.31 P (psi) = 7.152
Mon May 9 16:20:47 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.152	7.152
2	0.031	0.031	7.183	7.182
3	0.663	0.421	7.814	7.573
4	0.647	0.374	7.798	7.526
5	0.634	0.498	7.785	7.649
6	0.624	1.000	7.775	8.151
7	0.614	1.003	7.765	8.154
8	1.334	1.002	8.486	8.153
9	1.306	0.943	8.457	8.094
10	1.196	0.000	8.348	7.152
11	1.100	0.942	8.251	8.093
12	0.887		8.039	

RPM=880	H=56.08	P=49.25	P (psi) =	7.143
Mon	May		9 16:23:13	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.144	7.143
2	0.031	0.031	7.174	7.174
3	0.699	0.444	7.842	7.587
4	0.681	0.394	7.823	7.537
5	0.666	0.524	7.809	7.667
6	0.656	1.052	7.799	8.195
7	0.646	1.055	7.788	8.198
8	1.404	1.054	8.547	8.197
9	1.372	0.993	8.515	8.136
10	1.257	0.000	8.400	7.143
11	1.155	0.991	8.298	8.134
12	0.931		8.074	

RPM=900	H=56.33	P=49.19	P (psi) =	7.134
Mon	May		9 16:25:10	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.135	7.134
2	0.031	0.031	7.166	7.165
3	0.731	0.465	7.865	7.599
4	0.710	0.413	7.844	7.548
5	0.697	0.550	7.831	7.684
6	0.685	1.101	7.819	8.235
7	0.673	1.105	7.807	8.239
8	1.468	1.103	8.602	8.237
9	1.439	1.040	8.573	8.174
10	1.317	0.000	8.451	7.134
11	1.209	1.038	8.343	8.173
12	0.973		8.107	

RPM=920	H=56.65	P=49.15	P (psi) =	7.128
Mon	May		9 16:28:01	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.129	7.129
2	0.032	0.031	7.160	7.159
3	0.763	0.486	7.892	7.614
4	0.743	0.432	7.871	7.560
5	0.728	0.574	7.857	7.703
6	0.716	1.152	7.845	8.281
7	0.703	1.156	7.832	8.285
8	1.530	1.155	8.658	8.283
9	1.501	1.089	8.630	8.218
10	1.375	0.000	8.503	7.129
11	1.263	1.088	8.391	8.217
12	1.015		8.144	

RPM=940	H=56.92	P=49.11	P (psi) =	7.123
Mon	May		9 16:30:09	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.124	7.123
2	0.032	0.031	7.154	7.154
3	0.789	0.503	7.911	7.626
4	0.766	0.448	7.889	7.570
5	0.751	0.594	7.873	7.717
6	0.739	1.198	7.862	8.321
7	0.726	1.202	7.849	8.324
8	1.589	1.201	8.712	8.323
9	1.563	1.133	8.686	8.256
10	1.430	0.000	8.552	7.123
11	1.314	1.132	8.436	8.255
12	1.058		8.181	

RPM=960	H=57.19	P=49.05	P (psi) =	7.114
Mon	May		9 16:32:21	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.115	7.114
2	0.032	0.031	7.146	7.145
3	0.823	0.526	7.937	7.640
4	0.800	0.470	7.914	7.584
5	0.784	0.621	7.898	7.735
6	0.772	1.251	7.886	8.365
7	0.759	1.255	7.873	8.369
8	1.653	1.253	8.766	8.367
9	1.635	1.184	8.748	8.298
10	1.495	0.000	8.609	7.114
11	1.374	1.182	8.488	8.296
12	1.103		8.217	

RPM=980	H=57.52	P=48.99	P (psi) =	7.105
Mon	May		9 16:34:46	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	7.106	7.106
2	0.032	0.031	7.137	7.136
3	0.864	0.551	7.969	7.656
4	0.840	0.491	7.945	7.596
5	0.824	0.650	7.929	7.755
6	0.811	1.311	7.916	8.416
7	0.795	1.315	7.900	8.420
8	1.733	1.314	8.838	8.419
9	1.712	1.241	8.817	8.346
10	1.568	0.000	8.673	7.106
11	1.440	1.240	8.545	8.345
12	1.156		8.262	

RPM=1000	H=57.82	P=48.90	P (psi) =	7.092
Mon	May		9 16:36:46	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.094	7.093
2	0.032	0.031	7.124	7.123
3	0.900	0.575	7.992	7.667
4	0.875	0.514	7.967	7.606
5	0.860	0.679	7.952	7.771
6	0.848	1.367	7.940	8.459
7	0.831	1.371	7.923	8.464
8	1.799	1.370	8.891	8.462
9	1.787	1.296	8.879	8.388
10	1.637	0.001	8.729	7.093
11	1.500	1.294	8.593	8.386
12	1.204		8.296	

RPM=1020	H=58.14	P=48.82	P (psi) =	7.080
Mon	May		9 16:38:54	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	7.082	7.081
2	0.032	0.031	7.113	7.112
3	0.944	0.603	8.024	7.683
4	0.915	0.537	7.996	7.617
5	0.898	0.710	7.978	7.790
6	0.881	1.428	7.962	8.508
7	0.865	1.431	7.946	8.512
8	1.867	1.430	8.947	8.510
9	1.862	1.353	8.942	8.433
10	1.708	0.001	8.788	7.081
11	1.566	1.351	8.647	8.432
12	1.256		8.337	

RPM=1040 H=58.48 P=48.80 P (psi) = 7.078
Mon May 9 16:41:58 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.079	7.078
2	0.032	0.032	7.110	7.109
3	0.977	0.623	8.054	7.701
4	0.947	0.555	8.024	7.632
5	0.929	0.735	8.006	7.812
6	0.914	1.479	7.991	8.557
7	0.895	1.483	7.972	8.560
8	1.933	1.481	9.011	8.559
9	1.939	1.402	9.017	8.480
10	1.776	0.001	8.854	7.078
11	1.624	1.400	8.702	8.478
12	1.298		8.375	

RPM=1060 H=58.81 P=48.77 P (psi) = 7.073
Mon May 9 16:43:46 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.075	7.074
2	0.032	0.032	7.106	7.105
3	1.013	0.649	8.086	7.722
4	0.986	0.578	8.060	7.651
5	0.966	0.765	8.039	7.839
6	0.949	1.541	8.023	8.614
7	0.932	1.544	8.005	8.618
8	2.015	1.542	9.088	8.616
9	2.017	1.461	9.090	8.534
10	1.844	0.001	8.918	7.074
11	1.688	1.460	8.761	8.533
12	1.356		8.429	

RPM=1080 H=59.17 P=48.70 P (psi) = 7.063
Mon May 9 16:46:29 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.065	7.064
2	0.032	0.032	7.095	7.095
3	1.053	0.677	8.117	7.740
4	1.023	0.604	8.086	7.668
5	1.002	0.796	8.065	7.859
6	0.984	1.602	8.047	8.665
7	0.965	1.606	8.028	8.669
8	2.103	1.604	9.166	8.667
9	2.096	1.521	9.159	8.584
10	1.916	0.001	8.979	7.064
11	1.753	1.519	8.816	8.582
12	1.407		8.470	

RPM=1100 H=59.39 P=48.54 P (psi) = 7.040
Mon May 9 16:48:00 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.042	7.041
2	0.033	0.032	7.073	7.072
3	1.093	0.703	8.133	7.743
4	1.061	0.628	8.101	7.668
5	1.039	0.826	8.079	7.866
6	1.019	1.659	8.059	8.699
7	1.001	1.664	8.040	8.704
8	2.166	1.661	9.206	8.701
9	2.172	1.576	9.212	8.615
10	1.986	0.001	9.025	7.041
11	1.816	1.574	8.856	8.614
12	1.464		8.504	

RPM=1120 H=59.74 P=48.40 P (psi) = 7.020
Mon May 9 16:50:13 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.022	7.021
2	0.033	0.032	7.053	7.052
3	1.136	0.732	8.156	7.751
4	1.101	0.654	8.120	7.673
5	1.077	0.861	8.097	7.880
6	1.059	1.728	8.079	8.748
7	1.039	1.732	8.058	8.752
8	2.260	1.730	9.279	8.750
9	2.264	1.641	9.283	8.661
10	2.067	0.001	9.086	7.021
11	1.892	1.640	8.912	8.659
12	1.523		8.543	

RPM=1140 H=60.13 P=48.44 P (psi) = 7.025
Mon May 9 16:53:41 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.001	7.027	7.027
2	0.033	0.032	7.058	7.058
3	1.184	0.763	8.210	7.789
4	1.146	0.683	8.171	7.708
5	1.121	0.898	8.146	7.923
6	1.100	1.799	8.125	8.824
7	1.082	1.804	8.108	8.829
8	2.360	1.801	9.385	8.827
9	2.349	1.710	9.374	8.736
10	2.148	0.001	9.173	7.027
11	1.965	1.709	8.990	8.734
12	1.584		8.610	

RPM=1160 H=60.47 P=48.38 P (psi) = 7.017
Mon May 9 16:55:21 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.002	0.002	7.019	7.018
2	0.033	0.032	7.049	7.049
3	1.219	0.789	8.235	7.806
4	1.181	·0.706	8.197	7.722
5	1.157	0.928	8.174	7.945
6	1.138	1.855	8.155	8.872
7	1.116	1.861	8.133	8.878
8	2.421	1.859	9.437	8.876
9	2.430	1.766	9.447	8.783
10	2.221	0.001	9.237	7.018
11	2.028	1.764	9.044	8.781
12	1.638		8.655	

RPM=0 H=56.06 P=56.08 P (psi) = 8.133
Mon May 9 17:00:38 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	8.134	8.133
2	0.025	0.024	8.159	8.158
3	0.002	0.001	8.135	8.134
4	0.001	0.001	8.134	8.134
5	0.000	0.001	8.133	8.134
6	0.001	0.000	8.134	8.133
7	0.001	0.001	8.134	8.134
8	0.002	0.000	8.135	8.134
9	0.001	0.001	8.134	8.134
10	0.001	0.000	8.135	8.133
11	0.001	0.001	8.134	8.135
12	0.000		8.134	

A.2 Pressure Data – Nozzle 2 – Incremental (N2 INCR)

RPM=0 H=48.09 P=48.09 P (psi) = 6.975
Wed May 11 13:58:49 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	6.974	6.974
2	0.029	0.030	7.004	7.004
3	0.000	-0.001	6.974	6.974
4	-0.001	0.000	6.974	6.974
5	-0.001	-0.001	6.974	6.974
6	-0.001	0.000	6.974	6.975
7	0.000	-0.001	6.975	6.974
8	-0.001	0.000	6.974	6.975
9	-0.001	-0.001	6.974	6.974
10	-0.001	-0.001	6.974	6.974
11	-0.001	-0.001	6.974	6.974
12	-0.001		6.974	

RPM=400 H=49.22 P=48.11 P (psi) = 6.978
Wed May 11 14:04:55 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	6.977	6.977
2	0.029	0.030	7.007	7.007
3	0.110	0.063	7.088	7.040
4	0.107	0.054	7.085	7.031
5	0.105	0.076	7.083	7.054
6	0.104	0.175	7.081	7.152
7	0.102	0.175	7.080	7.152
8	0.234	0.174	7.211	7.152
9	0.228	0.158	7.205	7.135
10	0.211	-0.001	7.188	6.977
11	0.193	0.158	7.171	7.135
12	0.157		7.135	

RPM=420 H=49.41 P=48.20 P (psi) = 6.991
Wed May 11 14:07:49 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	6.990	6.990
2	0.029	0.030	7.020	7.020
3	0.124	0.070	7.114	7.061
4	0.120	0.060	7.110	7.051
5	0.118	0.086	7.108	7.076
6	0.116	0.194	7.107	7.184
7	0.115	0.194	7.105	7.184
8	0.260	0.193	7.251	7.184
9	0.254	0.176	7.244	7.166
10	0.234	-0.001	7.225	6.990
11	0.215	0.175	7.205	7.166
12	0.175		7.165	

RPM=440 H=49.58 P=48.23 P (psi) = 6.995
Wed May 11 14:10:13 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	6.995	6.994
2	0.029	0.030	7.024	7.025
3	0.137	0.079	7.132	7.074
4	0.133	0.067	7.128	7.062
5	0.131	0.096	7.126	7.091
6	0.129	0.214	7.124	7.209
7	0.127	0.215	7.122	7.210
8	0.290	0.215	7.284	7.210
9	0.282	0.195	7.277	7.190
10	0.260	-0.001	7.255	6.994
11	0.239	0.195	7.233	7.190
12	0.193		7.188	

RPM=460 H=49.72 P=48.25 P (psi) = 6.998
Wed May 11 14:12:17 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	6.998	6.997
2	0.029	0.030	7.027	7.027
3	0.151	0.086	7.149	7.084
4	0.147	0.074	7.145	7.072
5	0.145	0.105	7.142	7.103
6	0.143	0.235	7.141	7.233
7	0.141	0.235	7.138	7.233
8	0.318	0.235	7.316	7.233
9	0.309	0.214	7.306	7.212
10	0.285	-0.001	7.283	6.997
11	0.261	0.214	7.259	7.212
12	0.211		7.209	

RPM=480 H=49.92 P=48.29 P (psi) = 7.004
Wed May 11 14:15:25 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.003	7.003
2	0.029	0.029	7.033	7.033
3	0.167	0.095	7.171	7.099
4	0.162	0.082	7.166	7.085
5	0.160	0.116	7.163	7.120
6	0.158	0.258	7.161	7.262
7	0.155	0.259	7.159	7.262
8	0.352	0.259	7.355	7.262
9	0.341	0.237	7.345	7.240
10	0.314	-0.001	7.318	7.003
11	0.288	0.237	7.292	7.240
12	0.232		7.236	

RPM=500 H=50.09 P=48.31 P (psi) = 7.007
Wed May 11 14:17:50 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.006	7.006
2	0.029	0.029	7.036	7.036
3	0.184	0.104	7.190	7.111
4	0.178	0.090	7.185	7.096
5	0.175	0.128	7.182	7.135
6	0.173	0.283	7.179	7.290
7	0.170	0.284	7.177	7.290
8	0.387	0.283	7.394	7.290
9	0.375	0.260	7.381	7.267
10	0.344	-0.001	7.351	7.006
11	0.316	0.260	7.323	7.266
12	0.255		7.261	

RPM=520 H=50.27 P=48.33 P (psi) = 7.009
Wed May 11 14:20:29 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	-0.001	7.009	7.009
2	0.029	0.029	7.039	7.039
3	0.199	0.113	7.209	7.123
4	0.194	0.098	7.203	7.107
5	0.191	0.139	7.200	7.149
6	0.187	0.307	7.197	7.317
7	0.185	0.308	7.195	7.317
8	0.420	0.307	7.430	7.317
9	0.406	0.282	7.416	7.291
10	0.373	-0.001	7.382	7.009
11	0.343	0.281	7.352	7.291
12	0.275		7.284	

RPM=540	H=50.47	P=48.37	P (psi) = 7.015		RPM=560	H=50.66	P=48.38	P (psi) = 7.017	
Wed	May	11	14:23:31	1994	Wed	May	11	14:26:15	1994
	Average (psid)		Average (psia)			Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02	Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	7.015	7.015	1	0.000	-0.001	7.017	7.016
2	0.029	0.029	7.044	7.045	2	0.029	0.029	7.046	7.046
3	0.215	0.123	7.230	7.138	3	0.234	0.134	7.250	7.150
4	0.209	0.106	7.224	7.121	4	0.228	0.115	7.245	7.132
5	0.206	0.151	7.221	7.166	5	0.224	0.164	7.241	7.181
6	0.202	0.332	7.217	7.347	6	0.220	0.360	7.237	7.377
7	0.199	0.333	7.214	7.348	7	0.217	0.361	7.234	7.378
8	0.455	0.332	7.470	7.348	8	0.493	0.360	7.510	7.377
9	0.440	0.305	7.455	7.320	9	0.477	0.331	7.494	7.348
10	0.403	-0.001	7.418	7.015	10	0.438	0.000	7.454	7.016
11	0.370	0.305	7.386	7.320	11	0.402	0.331	7.418	7.348
12	0.297		7.313		12	0.322		7.339	

RPM=580	H=50.85	P=48.39	P (psi) = 7.018		RPM=600	H=51.05	P=48.38	P (psi) = 7.017	
Wed	May	11	14:28:49	1994	Wed	May	11	14:31:20	1994
	Average (psid)		Average (psia)			Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02	Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.018	7.018	1	0.000	0.000	7.017	7.016
2	0.029	0.029	7.047	7.047	2	0.029	0.029	7.046	7.046
3	0.253	0.145	7.271	7.163	3	0.269	0.155	7.286	7.172
4	0.247	0.125	7.265	7.143	4	0.263	0.134	7.280	7.150
5	0.242	0.178	7.260	7.196	5	0.259	0.191	7.276	7.208
6	0.238	0.387	7.256	7.406	6	0.255	0.417	7.272	7.433
7	0.235	0.389	7.253	7.407	7	0.251	0.418	7.268	7.434
8	0.533	0.389	7.551	7.407	8	0.570	0.418	7.587	7.435
9	0.516	0.358	7.534	7.376	9	0.552	0.385	7.569	7.402
10	0.474	0.000	7.492	7.018	10	0.507	0.000	7.523	7.016
11	0.434	0.358	7.452	7.376	11	0.464	0.385	7.481	7.401
12	0.349		7.367		12	0.372		7.389	

RPM=620	H=51.22	P=48.38	P (psi) = 7.017		RPM=640	H=51.42	P=48.36	P (psi) = 7.014	
Wed	May	11	14:33:22	1994	Wed	May	11	14:35:51	1994
	Average (psid)		Average (psia)			Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02	Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.017	7.016	1	0.000	0.000	7.014	7.013
2	0.029	0.029	7.046	7.046	2	0.029	0.029	7.043	7.043
3	0.289	0.165	7.305	7.182	3	0.313	0.179	7.327	7.193
4	0.281	0.142	7.298	7.159	4	0.303	0.155	7.317	7.168
5	0.276	0.203	7.293	7.220	5	0.298	0.219	7.312	7.233
6	0.272	0.445	7.289	7.462	6	0.294	0.479	7.308	7.493
7	0.267	0.446	7.284	7.463	7	0.289	0.480	7.302	7.494
8	0.613	0.446	7.630	7.463	8	0.661	0.479	7.675	7.493
9	0.592	0.412	7.608	7.428	9	0.639	0.444	7.653	7.458
10	0.542	0.000	7.559	7.016	10	0.584	0.000	7.598	7.014
11	0.497	0.411	7.513	7.428	11	0.535	0.443	7.548	7.457
12	0.396		7.413		12	0.426		7.439	

RPM=660	H=51.62	P=48.36	P (psi) = 7.014		RPM=680	H=51.83	P=48.36	P (psi) = 7.014	
Wed	May	11	14:38:13	1994	Wed	May	11	14:40:39	1994
	Average (psid)		Average (psia)			Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02	Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	7.014	7.013	1	0.000	0.000	7.014	7.014
2	0.029	0.029	7.043	7.043	2	0.029	0.029	7.043	7.043
3	0.334	0.192	7.348	7.205	3	0.353	0.203	7.367	7.217
4	0.325	0.166	7.339	7.179	4	0.343	0.175	7.357	7.189
5	0.319	0.235	7.333	7.249	5	0.337	0.249	7.351	7.263
6	0.315	0.513	7.329	7.527	6	0.332	0.542	7.345	7.556
7	0.309	0.514	7.323	7.528	7	0.325	0.544	7.338	7.557
8	0.708	0.513	7.722	7.527	8	0.748	0.543	7.762	7.557
9	0.685	0.475	7.699	7.489	9	0.722	0.503	7.736	7.517
10	0.626	0.000	7.639	7.013	10	0.661	0.000	7.675	7.014
11	0.572	0.474	7.586	7.488	11	0.604	0.502	7.618	7.516
12	0.455		7.469		12	0.481		7.494	

RPM=700 H=52.04 P=48.33 P (psi) = 7.009
Wed May 11 14:43:03 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.009	7.009
2	0.029	0.029	7.039	7.039
3	0.378	0.217	7.388	7.227
4	0.368	0.187	7.377	7.196
5	0.362	0.267	7.371	7.276
6	0.356	0.580	7.365	7.589
7	0.350	0.581	7.360	7.590
8	0.802	0.581	7.812	7.590
9	0.773	0.538	7.783	7.548
10	0.708	0.000	7.718	7.009
11	0.646	0.538	7.656	7.547
12	0.512		7.522	

RPM=720 H=52.34 P=48.42 P (psi) = 7.022
Wed May 11 14:47:08 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.023	7.022
2	0.029	0.029	7.052	7.052
3	0.399	0.230	7.421	7.253
4	0.388	0.198	7.410	7.221
5	0.381	0.282	7.404	7.305
6	0.374	0.614	7.397	7.637
7	0.368	0.616	7.390	7.638
8	0.847	0.616	7.869	7.638
9	0.818	0.571	7.841	7.593
10	0.749	0.000	7.771	7.022
11	0.684	0.570	7.706	7.593
12	0.543		7.565	

RPM=740 H=52.63 P=48.40 P (psi) = 7.020
Wed May 11 14:50:16 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.020	7.019
2	0.029	0.029	7.049	7.049
3	0.423	0.245	7.443	7.265
4	0.413	0.211	7.433	7.231
5	0.405	0.300	7.425	7.320
6	0.398	0.651	7.418	7.670
7	0.392	0.653	7.411	7.672
8	0.899	0.652	7.918	7.671
9	0.869	0.606	7.889	7.626
10	0.795	0.000	7.815	7.020
11	0.725	0.605	7.745	7.625
12	0.575		7.594	

RPM=760 H=52.92 P=48.47 P (psi) = 7.030
Wed May 11 14:54:07 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.030	7.030
2	0.029	0.029	7.059	7.059
3	0.451	0.262	7.481	7.292
4	0.440	0.226	7.470	7.256
5	0.432	0.321	7.462	7.350
6	0.426	0.693	7.456	7.723
7	0.419	0.695	7.449	7.725
8	0.955	0.694	7.985	7.724
9	0.925	0.645	7.954	7.675
10	0.846	0.000	7.876	7.030
11	0.772	0.645	7.802	7.674
12	0.612		7.642	

RPM=780 H=53.17 P=48.49 P (psi) = 7.033
Wed May 11 14:57:02 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.033	7.032
2	0.029	0.029	7.062	7.062
3	0.474	0.275	7.506	7.308
4	0.461	0.238	7.493	7.270
5	0.452	0.337	7.485	7.370
6	0.444	0.728	7.477	7.760
7	0.436	0.730	7.469	7.762
8	1.001	0.729	8.034	7.762
9	0.972	0.678	8.005	7.711
10	0.886	0.000	7.919	7.033
11	0.808	0.677	7.841	7.710
12	0.639		7.672	

RPM=800 H=53.39 P=48.46 P (psi) = 7.028
Wed May 11 14:59:20 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.029	7.028
2	0.029	0.029	7.057	7.058
3	0.499	0.292	7.527	7.320
4	0.486	0.252	7.515	7.280
5	0.479	0.357	7.507	7.386
6	0.471	0.768	7.499	7.797
7	0.461	0.771	7.490	7.799
8	1.057	0.770	8.086	7.798
9	1.027	0.718	8.055	7.746
10	0.937	0.000	7.965	7.028
11	0.855	0.717	7.883	7.745
12	0.678		7.706	

RPM=820 H=53.65 P=48.43 P (psi) = 7.024
Wed May 11 15:01:42 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.024	7.024
2	0.029	0.029	7.053	7.053
3	0.525	0.307	7.549	7.331
4	0.511	0.266	7.535	7.290
5	0.504	0.376	7.527	7.400
6	0.495	0.809	7.519	7.833
7	0.487	0.811	7.511	7.835
8	1.115	0.811	8.139	7.835
9	1.081	0.756	8.105	7.780
10	0.987	0.000	8.011	7.024
11	0.900	0.755	7.924	7.779
12	0.711		7.735	

RPM=840 H=53.91 P=48.42 P (psi) = 7.022
Wed May 11 15:04:17 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	7.023	7.023
2	0.029	0.029	7.052	7.052
3	0.556	0.325	7.579	7.348
4	0.541	0.282	7.563	7.304
5	0.532	0.398	7.554	7.421
6	0.523	0.853	7.546	7.876
7	0.514	0.855	7.537	7.877
8	1.177	0.854	8.199	7.876
9	1.141	0.797	8.163	7.820
10	1.041	0.000	8.064	7.023
11	0.948	0.796	7.971	7.818
12	0.749		7.772	

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RPM=860   H=54.17   P=48.38   P (psi) = 7.017
Wed   May   11   15:06:52   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.017	7.017
2	0.029	0.029	7.046	7.046
3	0.584	0.343	7.601	7.359
4	0.569	0.297	7.586	7.313
5	0.561	0.419	7.577	7.436
6	0.551	0.897	7.568	7.913
7	0.541	0.899	7.558	7.916
8	1.238	0.898	8.254	7.915
9	1.203	0.839	8.220	7.855
10	1.096	0.000	8.113	7.017
11	0.997	0.838	8.013	7.855
12	0.784		7.801	

RPM=880   H=54.46   P=48.37   P (psi) = 7.015
Wed   May   11   15:09:39   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.016	7.015
2	0.029	0.029	7.045	7.045
3	0.615	0.362	7.630	7.377
4	0.598	0.312	7.614	7.328
5	0.588	0.442	7.603	7.457
6	0.577	0.945	7.593	7.960
7	0.568	0.946	7.583	7.961
8	1.302	0.945	8.317	7.960
9	1.264	0.883	8.279	7.898
10	1.152	0.000	8.167	7.015
11	1.047	0.882	8.062	7.897
12	0.824		7.839	

RPM=900   H=54.76   P=48.36   P (psi) = 7.014
Wed   May   11   15:12:03   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.014	7.014
2	0.029	0.029	7.043	7.043
3	0.645	0.380	7.659	7.394
4	0.628	0.328	7.642	7.342
5	0.618	0.464	7.632	7.478
6	0.607	0.993	7.621	8.007
7	0.596	0.995	7.610	8.009
8	1.368	0.995	8.382	8.008
9	1.331	0.930	8.345	7.943
10	1.214	0.000	8.228	7.014
11	1.103	0.929	8.117	7.943
12	0.865		7.879	

RPM=920   H=55.11   P=48.43   P (psi) = 7.024
Wed   May   11   15:15:43   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.025	7.024
2	0.029	0.030	7.053	7.054
3	0.668	0.393	7.692	7.417
4	0.650	0.339	7.674	7.363
5	0.638	0.480	7.662	7.504
6	0.626	1.029	7.650	8.053
7	0.613	1.031	7.637	8.055
8	1.412	1.029	8.436	8.053
9	1.377	0.964	8.401	7.988
10	1.256	0.000	8.280	7.024
11	1.140	0.963	8.163	7.987
12	0.895		7.919	

RPM=940   H=55.46   P=48.43   P (psi) = 7.024
Wed   May   11   15:19:15   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.025	7.024
2	0.029	0.029	7.053	7.053
3	0.700	0.414	7.724	7.438
4	0.681	0.359	7.705	7.383
5	0.669	0.506	7.693	7.530
6	0.657	1.086	7.681	8.110
7	0.644	1.089	7.668	8.113
8	1.494	1.087	8.517	8.111
9	1.456	1.018	8.479	8.042
10	1.325	0.000	8.349	7.024
11	1.205	1.017	8.228	8.041
12	0.943		7.967	

RPM=960   H=55.71   P=48.42   P (psi) = 7.022
Wed   May   11   15:21:18   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.023	7.023
2	0.030	0.030	7.052	7.052
3	0.727	0.429	7.749	7.452
4	0.705	0.372	7.727	7.395
5	0.692	0.524	7.714	7.546
6	0.679	1.127	7.701	8.150
7	0.664	1.130	7.687	8.152
8	1.545	1.128	8.568	8.151
9	1.509	1.057	8.531	8.080
10	1.374	0.001	8.397	7.023
11	1.248	1.056	8.271	8.079
12	0.975		7.997	

RPM=980   H=56.04   P=48.41   P (psi) = 7.021
Wed   May   11   15:24:02   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	7.022	7.022
2	0.029	0.030	7.051	7.051
3	0.764	0.452	7.785	7.473
4	0.744	0.391	7.765	7.412
5	0.731	0.552	7.752	7.573
6	0.717	1.182	7.738	8.203
7	0.702	1.185	7.723	8.206
8	1.626	1.184	8.647	8.205
9	1.586	1.110	8.607	8.131
10	1.444	0.001	8.465	7.022
11	1.312	1.109	8.333	8.130
12	1.025		8.046	

RPM=1000   H=56.38   P=48.43   P (psi) = 7.024
Wed   May   11   15:27:06   1994

	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	7.025	7.025
2	0.030	0.030	7.053	7.053
3	0.793	0.470	7.817	7.494
4	0.770	0.408	7.794	7.432
5	0.757	0.574	7.780	7.598
6	0.744	1.229	7.768	8.253
7	0.729	1.232	7.753	8.256
8	1.682	1.231	8.706	8.255
9	1.649	1.155	8.673	8.179
10	1.503	0.001	8.527	7.025
11	1.362	1.155	8.386	8.178
12	1.061		8.085	

RPM=1020 H=56.73 P=48.40 P (psi) = 7.020
Wed May 11 15:29:41 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.021	7.020
2	0.030	0.030	7.049	7.049
3	0.830	0.492	7.850	7.512
4	0.807	0.427	7.827	7.446
5	0.794	0.600	7.814	7.620
6	0.779	1.283	7.799	8.302
7	0.760	1.286	7.780	8.306
8	1.746	1.284	8.766	8.304
9	1.724	1.207	8.744	8.226
10	1.574	0.001	8.593	7.020
11	1.425	1.205	8.444	8.225
12	1.112		8.132	

RPM=1040 H=57.03 P=48.38 P (psi) = 7.017
Wed May 11 15:32:12 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.018	7.017
2	0.030	0.030	7.047	7.047
3	0.861	0.510	7.878	7.527
4	0.838	0.441	7.855	7.458
5	0.823	0.622	7.840	7.638
6	0.808	1.333	7.825	8.349
7	0.790	1.336	7.807	8.352
8	1.816	1.334	8.833	8.351
9	1.797	1.254	8.814	8.270
10	1.637	0.001	8.654	7.017
11	1.481	1.253	8.497	8.269
12	1.152		8.168	

RPM=1060 H=57.36 P=48.34 P (psi) = 7.011
Wed May 11 15:34:41 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.012	7.012
2	0.030	0.030	7.040	7.041
3	0.895	0.532	7.906	7.543
4	0.872	0.461	7.883	7.472
5	0.856	0.648	7.867	7.659
6	0.840	1.388	7.851	8.399
7	0.823	1.392	7.834	8.402
8	1.895	1.390	8.906	8.401
9	1.872	1.307	8.883	8.318
10	1.699	0.001	8.710	7.012
11	1.537	1.306	8.547	8.317
12	1.206		8.217	

RPM=1080 H=57.65 P=48.27 P (psi) = 7.001
Wed May 11 15:37:05 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.002	7.002
2	0.030	0.030	7.031	7.031
3	0.934	0.556	7.935	7.556
4	0.908	0.482	7.909	7.483
5	0.890	0.674	7.890	7.675
6	0.872	1.446	7.873	8.447
7	0.854	1.449	7.855	8.450
8	1.982	1.448	8.982	8.448
9	1.950	1.362	8.951	8.363
10	1.766	0.001	8.767	7.002
11	1.597	1.360	8.598	8.361
12	1.252		8.253	

RPM=1100 H=57.90 P=48.18 P (psi) = 6.988
Wed May 11 15:39:12 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	6.989	6.989
2	0.030	0.030	7.017	7.017
3	0.966	0.578	7.954	7.565
4	0.938	0.501	7.926	7.489
5	0.920	0.701	7.907	7.689
6	0.903	1.496	7.891	8.484
7	0.883	1.501	7.871	8.489
8	2.033	1.500	9.021	8.487
9	2.021	1.412	9.009	8.400
10	1.832	0.001	8.820	6.989
11	1.655	1.411	8.643	8.398
12	1.300		8.288	

RPM=1120 H=58.24 P=48.13 P (psi) = 6.980
Wed May 11 15:41:44 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	6.982	6.982
2	0.030	0.030	7.010	7.010
3	1.006	0.603	7.987	7.583
4	0.977	0.522	7.957	7.502
5	0.957	0.731	7.937	7.712
6	0.939	1.559	7.920	8.540
7	0.920	1.563	7.901	8.543
8	2.125	1.560	9.106	8.540
9	2.105	1.470	9.085	8.451
10	1.908	0.001	8.888	6.982
11	1.728	1.469	8.708	8.450
12	1.355		8.336	

RPM=1140 H=58.61 P=48.10 P (psi) = 6.976
Wed May 11 15:44:28 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	6.978	6.977
2	0.030	0.030	7.006	7.006
3	1.037	0.623	8.013	7.599
4	1.006	0.540	7.982	7.516
5	0.984	0.756	7.960	7.732
6	0.965	1.607	7.941	8.583
7	0.946	1.612	7.922	8.588
8	2.185	1.609	9.161	8.585
9	2.167	1.518	9.143	8.494
10	1.965	0.001	8.941	6.977
11	1.778	1.517	8.754	8.493
12	1.395		8.371	

RPM=1160 H=58.91 P=48.01 P (psi) = 6.963
Wed May 11 15:46:44 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	6.964	6.964
2	0.030	0.030	6.993	6.993
3	1.081	0.651	8.044	7.614
4	1.047	0.565	8.011	7.528
5	1.026	0.789	7.989	7.752
6	1.007	1.680	7.970	8.643
7	0.988	1.684	7.951	8.647
8	2.278	1.681	9.241	8.645
9	2.266	1.586	9.229	8.549
10	2.060	0.001	9.023	6.964
11	1.858	1.585	8.821	8.548
12	1.453		8.416	

RPM=0	H=54.88	P=54.89	P (psi) = 7.961		RPM=0	H=55.11	P=55.11	P (psi) = 7.993	
Wed	May	11	15:50:26	1994	Wed	May	11	15:56:55	1994
	Average (psid)		Average (psia)			Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02	Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	7.961	7.960	1	0.000	-0.001	7.993	7.992
2	0.023	0.023	7.984	7.984	2	0.024	0.023	8.016	8.016
3	0.000	0.001	7.961	7.961	3	0.000	0.001	7.993	7.993
4	0.000	0.001	7.961	7.961	4	0.000	0.000	7.992	7.993
5	0.000	0.000	7.961	7.961	5	-0.001	0.000	7.992	7.992
6	0.000	0.000	7.961	7.961	6	0.000	0.000	7.993	7.993
7	0.000	0.001	7.961	7.961	7	0.000	0.000	7.993	7.993
8	0.000	0.000	7.960	7.961	8	0.000	-0.001	7.992	7.992
9	0.000	-0.001	7.961	7.960	9	-0.001	-0.001	7.992	7.992
10	0.000	0.000	7.961	7.961	10	0.000	0.000	7.993	7.992
11	0.000	0.001	7.961	7.961	11	0.000	0.001	7.992	7.993
12	0.000		7.961		12	0.000		7.992	

A.3 Pressure Data – Nozzle 3 – Incremental (N3 INCR)

RPM=0 H=48.28 P=48.28 P (psi) = 7.002
Fri May 13 13:50:42 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	7.002	7.001
2	0.029	0.029	7.032	7.031
3	0.000	0.000	7.002	7.002
4	0.000	0.000	7.002	7.002
5	0.000	0.000	7.002	7.002
6	0.000	0.000	7.003	7.003
7	0.000	0.000	7.002	7.002
8	0.000	0.000	7.002	7.002
9	0.000	-0.001	7.002	7.001
10	0.000	0.000	7.002	7.002
11	0.000	0.000	7.002	7.002
12	0.000		7.002	

RPM=400 H=48.75 P=47.84 P (psi) = 6.938
Fri May 13 13:53:58 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.939	6.938
2	0.030	0.030	6.968	6.968
3	0.089	0.040	7.028	6.978
4	0.086	0.030	7.024	6.968
5	0.084	0.054	7.022	6.993
6	0.083	0.148	7.021	7.086
7	0.081	0.148	7.019	7.087
8	0.213	0.148	7.152	7.086
9	0.206	0.131	7.144	7.069
10	0.187	0.000	7.126	6.938
11	0.169	0.131	7.108	7.069
12	0.130		7.068	

RPM=420 H=48.90 P=47.89 P (psi) = 6.946
Fri May 13 13:56:26 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.946	6.945
2	0.030	0.030	6.975	6.975
3	0.100	0.044	7.045	6.990
4	0.096	0.033	7.042	6.979
5	0.094	0.061	7.039	7.007
6	0.093	0.164	7.038	7.110
7	0.091	0.165	7.036	7.111
8	0.239	0.165	7.184	7.110
9	0.229	0.146	7.175	7.091
10	0.209	0.000	7.155	6.945
11	0.189	0.146	7.134	7.091
12	0.144		7.090	

RPM=440 H=49.00 P=47.89 P (psi) = 6.946
Fri May 13 13:57:48 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.946	6.945
2	0.030	0.030	6.975	6.975
3	0.110	0.049	7.055	6.994
4	0.105	0.037	7.051	6.982
5	0.102	0.067	7.048	7.013
6	0.101	0.181	7.047	7.126
7	0.098	0.181	7.044	7.127
8	0.263	0.181	7.209	7.126
9	0.252	0.161	7.198	7.106
10	0.229	0.000	7.175	6.945
11	0.207	0.161	7.152	7.106
12	0.158		7.103	

RPM=460 H=49.14 P=47.92 P (psi) = 6.950
Fri May 13 14:00:02 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	-0.001	6.950	6.949
2	0.030	0.030	6.980	6.980
3	0.122	0.054	7.072	7.004
4	0.117	0.041	7.067	6.991
5	0.114	0.074	7.064	7.024
6	0.114	0.199	7.064	7.149
7	0.110	0.200	7.060	7.150
8	0.291	0.199	7.241	7.149
9	0.278	0.177	7.228	7.127
10	0.253	0.000	7.203	6.950
11	0.227	0.177	7.177	7.127
12	0.174		7.124	

RPM=480 H=49.31 P=47.95 P (psi) = 6.954
Fri May 13 14:02:38 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.955	6.954
2	0.030	0.030	6.984	6.984
3	0.135	0.060	7.090	7.014
4	0.130	0.046	7.084	7.000
5	0.127	0.083	7.081	7.037
6	0.125	0.219	7.080	7.173
7	0.122	0.220	7.076	7.174
8	0.322	0.220	7.276	7.174
9	0.308	0.196	7.262	7.151
10	0.280	0.000	7.234	6.954
11	0.251	0.196	7.206	7.151
12	0.191		7.145	

RPM=500 H=49.48 P=48.00 P (psi) = 6.962
Fri May 13 14:05:25 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.962	6.961
2	0.030	0.029	6.991	6.991
3	0.148	0.066	7.109	7.027
4	0.142	0.050	7.104	7.012
5	0.139	0.090	7.100	7.052
6	0.137	0.238	7.098	7.199
7	0.133	0.239	7.095	7.200
8	0.351	0.239	7.313	7.201
9	0.335	0.214	7.296	7.175
10	0.304	0.000	7.265	6.961
11	0.273	0.214	7.235	7.175
12	0.207		7.169	

RPM=520 H=49.65 P=48.04 P (psi) = 6.967
Fri May 13 14:08:03 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.968	6.967
2	0.030	0.029	6.997	6.997
3	0.160	0.071	7.128	7.039
4	0.154	0.055	7.122	7.022
5	0.150	0.098	7.118	7.066
6	0.148	0.258	7.116	7.225
7	0.144	0.259	7.112	7.226
8	0.381	0.259	7.348	7.226
9	0.363	0.232	7.330	7.199
10	0.329	0.000	7.297	6.967
11	0.296	0.232	7.263	7.199
12	0.224		7.192	

RPM=540 H=49.81 P=48.06 P (psi) = 6.970
Fri May 13 14:10:22 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.971	6.970
2	0.030	0.029	7.000	7.000
3	0.175	0.078	7.145	7.048
4	0.168	0.060	7.138	7.030
5	0.164	0.107	7.134	7.077
6	0.162	0.281	7.132	7.251
7	0.158	0.282	7.128	7.252
8	0.416	0.281	7.386	7.251
9	0.395	0.253	7.365	7.224
10	0.358	0.000	7.328	6.970
11	0.322	0.253	7.292	7.223
12	0.243		7.213	

RPM=560 H=49.95 P=48.06 P (psi) = 6.970
Fri May 13 14:12:15 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.971	6.970
2	0.030	0.029	7.000	7.000
3	0.191	0.085	7.161	7.055
4	0.183	0.065	7.153	7.036
5	0.178	0.117	7.148	7.087
6	0.175	0.304	7.145	7.275
7	0.171	0.305	7.141	7.276
8	0.451	0.305	7.422	7.275
9	0.429	0.275	7.399	7.245
10	0.388	0.000	7.359	6.970
11	0.349	0.274	7.319	7.244
12	0.263		7.233	

RPM=580 H=50.10 P=48.07 P (psi) = 6.972
Fri May 13 14:14:23 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.972	6.971
2	0.030	0.029	7.001	7.001
3	0.205	0.092	7.177	7.063
4	0.198	0.071	7.169	7.043
5	0.192	0.126	7.164	7.098
6	0.189	0.328	7.161	7.299
7	0.185	0.329	7.157	7.300
8	0.485	0.328	7.457	7.300
9	0.463	0.296	7.435	7.268
10	0.420	0.000	7.392	6.972
11	0.377	0.296	7.349	7.267
12	0.284		7.256	

RPM=600 H=50.26 P=48.07 P (psi) = 6.972
Fri May 13 14:16:26 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.972	6.971
2	0.030	0.029	7.001	7.001
3	0.221	0.099	7.192	7.070
4	0.212	0.076	7.183	7.048
5	0.206	0.136	7.178	7.108
6	0.202	0.352	7.174	7.324
7	0.199	0.353	7.171	7.325
8	0.522	0.353	7.494	7.325
9	0.498	0.319	7.470	7.291
10	0.451	0.000	7.423	6.972
11	0.404	0.318	7.375	7.290
12	0.305		7.276	

RPM=620 H=50.41 P=48.06 P (psi) = 6.970
Fri May 13 14:18:09 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.971	6.970
2	0.030	0.030	7.000	7.000
3	0.236	0.105	7.206	7.076
4	0.228	0.082	7.198	7.052
5	0.222	0.146	7.192	7.116
6	0.217	0.378	7.188	7.348
7	0.213	0.379	7.184	7.349
8	0.562	0.378	7.532	7.349
9	0.535	0.342	7.505	7.313
10	0.486	0.000	7.456	6.970
11	0.433	0.342	7.404	7.312
12	0.326		7.297	

RPM=640 H=50.59 P=48.06 P (psi) = 6.970
Fri May 13 14:20:26 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.971	6.970
2	0.030	0.029	7.000	7.000
3	0.252	0.113	7.223	7.083
4	0.244	0.088	7.214	7.058
5	0.237	0.157	7.207	7.127
6	0.233	0.404	7.203	7.375
7	0.229	0.405	7.199	7.375
8	0.602	0.405	7.573	7.375
9	0.572	0.367	7.542	7.337
10	0.518	0.000	7.489	6.970
11	0.463	0.366	7.433	7.337
12	0.348		7.318	

RPM=660 H=50.76 P=48.08 P (psi) = 6.973
Fri May 13 14:22:36 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.974	6.973
2	0.030	0.029	7.003	7.003
3	0.270	0.120	7.243	7.093
4	0.260	0.093	7.233	7.066
5	0.253	0.167	7.226	7.140
6	0.249	0.430	7.222	7.404
7	0.244	0.431	7.217	7.405
8	0.643	0.432	7.616	7.405
9	0.611	0.391	7.584	7.365
10	0.553	0.000	7.526	6.973
11	0.493	0.391	7.466	7.364
12	0.370		7.343	

RPM=680 H=50.95 P=48.08 P (psi) = 6.973
Fri May 13 14:24:44 1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.000	0.000	6.974	6.973
2	0.030	0.029	7.003	7.003
3	0.286	0.128	7.259	7.101
4	0.276	0.099	7.249	7.072
5	0.269	0.177	7.242	7.150
6	0.264	0.458	7.238	7.431
7	0.259	0.460	7.232	7.433
8	0.684	0.459	7.657	7.433
9	0.649	0.417	7.623	7.390
10	0.589	0.000	7.562	6.973
11	0.526	0.417	7.499	7.390
12	0.394		7.367	

RPM=700 Fri	H=51.13 May	P=48.10 13	P (psi) = 6.976 14:27:02 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.977	6.976
2	0.029	0.029	7.005	7.006
3	0.305	0.136	7.281	7.112
4	0.293	0.105	7.269	7.082
5	0.286	0.189	7.262	7.165
6	0.281	0.487	7.257	7.463
7	0.276	0.488	7.252	7.464
8	0.728	0.487	7.704	7.463
9	0.692	0.444	7.668	7.420
10	0.628	0.000	7.604	6.976
11	0.559	0.443	7.535	7.419
12	0.416		7.392	

RPM=720 Fri	H=51.33 May	P=48.12 13	P (psi) = 6.979 14:29:10 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.000	0.000	6.979	6.979
2	0.030	0.029	7.009	7.008
3	0.323	0.144	7.302	7.123
4	0.311	0.112	7.289	7.091
5	0.303	0.200	7.282	7.179
6	0.298	0.516	7.277	7.495
7	0.292	0.517	7.271	7.496
8	0.773	0.516	7.752	7.495
9	0.733	0.471	7.712	7.450
10	0.665	0.000	7.644	6.979
11	0.592	0.470	7.571	7.449
12	0.441		7.420	

RPM=740 Fri	H=51.53 May	P=48.10 13	P (psi) = 6.976 14:31:12 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.977	6.976
2	0.030	0.029	7.006	7.005
3	0.343	0.153	7.319	7.130
4	0.329	0.119	7.305	7.096
5	0.320	0.212	7.296	7.188
6	0.315	0.544	7.291	7.520
7	0.309	0.546	7.285	7.522
8	0.816	0.545	7.792	7.521
9	0.775	0.497	7.751	7.473
10	0.703	0.000	7.679	6.976
11	0.625	0.496	7.601	7.472
12	0.466		7.443	

RPM=760 Fri	H=51.72 May	P=48.08 13	P (psi) = 6.973 14:32:56 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.974	6.973
2	0.030	0.029	7.003	7.003
3	0.365	0.163	7.338	7.136
4	0.350	0.127	7.323	7.100
5	0.340	0.225	7.313	7.198
6	0.334	0.579	7.307	7.552
7	0.328	0.581	7.301	7.554
8	0.869	0.580	7.842	7.553
9	0.826	0.530	7.799	7.503
10	0.747	0.000	7.720	6.973
11	0.664	0.529	7.637	7.502
12	0.494		7.467	

RPM=780 Fri	H=51.95 May	P=48.12 13	P (psi) = 6.979 14:35:35 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.980	6.979
2	0.030	0.029	7.009	7.008
3	0.383	0.173	7.362	7.152
4	0.369	0.134	7.348	7.113
5	0.359	0.239	7.338	7.218
6	0.352	0.610	7.331	7.589
7	0.345	0.612	7.324	7.591
8	0.912	0.611	7.891	7.590
9	0.867	0.558	7.845	7.537
10	0.785	0.000	7.764	6.979
11	0.698	0.557	7.677	7.536
12	0.519		7.498	

RPM=800 Fri	H=52.16 May	P=48.10 13	P (psi) = 6.976 14:37:25 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.977	6.976
2	0.030	0.030	7.006	7.006
3	0.404	0.183	7.380	7.159
4	0.388	0.142	7.364	7.118
5	0.378	0.252	7.354	7.228
6	0.371	0.644	7.347	7.620
7	0.365	0.645	7.341	7.621
8	0.961	0.644	7.937	7.620
9	0.914	0.589	7.890	7.565
10	0.828	0.000	7.804	6.976
11	0.735	0.589	7.711	7.565
12	0.547		7.523	

RPM=820 Fri	H=52.36 May	P=48.08 13	P (psi) = 6.973 14:39:37 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.974	6.973
2	0.030	0.029	7.003	7.002
3	0.425	0.193	7.398	7.166
4	0.408	0.150	7.381	7.123
5	0.397	0.265	7.370	7.239
6	0.388	0.674	7.361	7.647
7	0.382	0.676	7.355	7.650
8	1.011	0.676	7.984	7.649
9	0.960	0.619	7.933	7.592
10	0.870	0.000	7.843	6.974
11	0.773	0.618	7.746	7.591
12	0.575		7.549	

RPM=840 Fri	H=52.59 May	P=48.10 13	P (psi) = 6.976 14:41:46 1994	
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.977	6.976
2	0.030	0.030	7.006	7.006
3	0.447	0.204	7.423	7.180
4	0.431	0.158	7.407	7.134
5	0.420	0.280	7.397	7.256
6	0.412	0.711	7.388	7.687
7	0.404	0.712	7.380	7.689
8	1.063	0.711	8.039	7.687
9	1.013	0.652	7.989	7.628
10	0.917	0.000	7.893	6.976
11	0.812	0.651	7.788	7.627
12	0.602		7.578	

RPM=860 H=52.81 P=48.09 P (psi) = 6.975
Fri May 13 14:43:46 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.975	6.975
2	0.030	0.030	7.004	7.004
3	0.468	0.214	7.443	7.189
4	0.451	0.166	7.426	7.141
5	0.439	0.295	7.414	7.269
6	0.431	0.746	7.406	7.720
7	0.422	0.747	7.397	7.722
8	1.118	0.746	8.092	7.721
9	1.067	0.685	8.042	7.659
10	0.965	0.000	7.939	6.975
11	0.854	0.684	7.829	7.658
12	0.634		7.608	

RPM=880 H=53.14 P=48.15 P (psi) = 6.983
Fri May 13 14:47:25 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.984	6.984
2	0.030	0.029	7.013	7.013
3	0.493	0.226	7.476	7.209
4	0.474	0.176	7.457	7.159
5	0.462	0.311	7.446	7.294
6	0.454	0.784	7.437	7.768
7	0.444	0.787	7.428	7.770
8	1.176	0.786	8.160	7.770
9	1.121	0.721	8.104	7.705
10	1.013	0.000	7.997	6.984
11	0.898	0.720	7.881	7.704
12	0.666		7.650	

RPM=900 H=53.35 P=48.14 P (psi) = 6.982
Fri May 13 14:48:53 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.983	6.982
2	0.030	0.029	7.012	7.011
3	0.514	0.234	7.496	7.216
4	0.494	0.182	7.476	7.164
5	0.482	0.323	7.464	7.304
6	0.472	0.818	7.454	7.800
7	0.463	0.820	7.445	7.802
8	1.228	0.820	8.210	7.801
9	1.171	0.753	8.153	7.735
10	1.059	0.000	8.040	6.982
11	0.938	0.752	7.919	7.734
12	0.690		7.672	

RPM=920 H=53.61 P=48.15 P (psi) = 6.983
Fri May 13 14:51:16 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	6.984	6.984
2	0.030	0.030	7.013	7.013
3	0.544	0.247	7.527	7.230
4	0.523	0.192	7.506	7.175
5	0.510	0.340	7.493	7.323
6	0.501	0.864	7.484	7.847
7	0.490	0.865	7.473	7.849
8	1.302	0.864	8.286	7.847
9	1.233	0.795	8.217	7.778
10	1.112	0.001	8.095	6.984
11	0.984	0.794	7.967	7.777
12	0.723		7.706	

RPM=940 H=53.89 P=48.18 P (psi) = 6.988
Fri May 13 14:53:31 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	6.989	6.988
2	0.030	0.030	7.017	7.017
3	0.564	0.256	7.551	7.244
4	0.540	0.201	7.528	7.189
5	0.526	0.352	7.513	7.340
6	0.515	0.896	7.503	7.884
7	0.506	0.899	7.494	7.886
8	1.349	0.897	8.337	7.884
9	1.287	0.826	8.275	7.813
10	1.160	0.001	8.147	6.988
11	1.026	0.825	8.013	7.812
12	0.754		7.741	

RPM=960 H=54.21 P=48.23 P (psi) = 6.995
Fri May 13 14:56:31 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	6.996	6.996
2	0.030	0.030	7.024	7.024
3	0.590	0.268	7.585	7.263
4	0.567	0.210	7.562	7.205
5	0.553	0.368	7.548	7.363
6	0.542	0.937	7.537	7.931
7	0.531	0.939	7.526	7.934
8	1.403	0.938	8.398	7.933
9	1.347	0.864	8.342	7.859
10	1.214	0.001	8.209	6.996
11	1.072	0.862	8.067	7.857
12	0.789		7.784	

RPM=980 H=54.46 P=48.27 P (psi) = 7.001
Fri May 13 14:58:20 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	7.002	7.001
2	0.030	0.029	7.030	7.030
3	0.614	0.280	7.615	7.280
4	0.592	0.219	7.593	7.220
5	0.577	0.386	7.578	7.386
6	0.566	0.977	7.567	7.977
7	0.556	0.979	7.556	7.980
8	1.469	0.978	8.470	7.979
9	1.407	0.901	8.408	7.902
10	1.269	0.001	8.270	7.001
11	1.121	0.900	8.121	7.901
12	0.822		7.823	

RPM=1000 H=54.72 P=48.23 P (psi) = 6.995
Fri May 13 15:00:15 1994

Transducer	Average (psid)		Average (psia)	
	sc-01	sc-02	sc-01	sc-02
1	0.001	0.001	6.996	6.996
2	0.030	0.029	7.025	7.024
3	0.641	0.291	7.636	7.286
4	0.616	0.229	7.611	7.224
5	0.601	0.401	7.596	7.396
6	0.592	1.019	7.587	8.014
7	0.581	1.021	7.576	8.016
8	1.526	1.020	8.521	8.015
9	1.473	0.941	8.468	7.936
10	1.328	0.001	8.322	6.996
11	1.168	0.940	8.163	7.935
12	0.860		7.855	

RPM=1020   H=55.02   P=48.30   P (psi) = 7.005
Fri   May   13   15:02:42   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.006	7.006
2	0.030	0.030	7.035	7.035
3	0.665	0.303	7.670	7.308
4	0.639	0.237	7.644	7.242
5	0.624	0.416	7.629	7.421
6	0.613	1.060	7.618	8.065
7	0.600	1.063	7.605	8.068
8	1.588	1.061	8.593	8.066
9	1.532	0.980	8.537	7.985
10	1.383	0.001	8.388	7.006
11	1.215	0.978	8.220	7.983
12	0.893		7.898	

RPM=1040   H=55.27   P=48.31   P (psi) = 7.007
Fri   May   13   15:04:37   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.008	7.007
2	0.030	0.030	7.036	7.036
3	0.688	0.314	7.695	7.320
4	0.664	0.245	7.670	7.252
5	0.646	0.431	7.653	7.438
6	0.634	1.094	7.641	8.100
7	0.621	1.097	7.627	8.104
8	1.653	1.095	8.660	8.102
9	1.592	1.012	8.598	8.019
10	1.430	0.001	8.437	7.007
11	1.256	1.010	8.262	8.017
12	0.925		7.931	

RPM=1060   H=55.54   P=48.28   P (psi) = 7.002
Fri   May   13   15:06:12   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.003	7.003
2	0.030	0.030	7.032	7.032
3	0.716	0.326	7.718	7.328
4	0.690	0.255	7.692	7.257
5	0.671	0.448	7.673	7.450
6	0.657	1.137	7.659	8.139
7	0.642	1.140	7.644	8.142
8	1.710	1.138	8.712	8.140
9	1.657	1.053	8.659	8.055
10	1.485	0.001	8.487	7.003
11	1.306	1.051	8.308	8.053
12	0.965		7.967	

RPM=1080   H=55.81   P=48.28   P (psi) = 7.002
Fri   May   13   15:08:01   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.003	7.003
2	0.030	0.029	7.032	7.032
3	0.745	0.341	7.747	7.343
4	0.715	0.270	7.717	7.272
5	0.694	0.467	7.696	7.470
6	0.676	1.182	7.678	8.184
7	0.661	1.186	7.663	8.188
8	1.772	1.184	8.775	8.186
9	1.723	1.096	8.725	8.098
10	1.545	0.001	8.547	7.003
11	1.358	1.094	8.360	8.096
12	1.003		8.005	

RPM=1100   H=56.13   P=48.34   P (psi) = 7.011
Fri   May   13   15:10:20   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.001	0.001	7.012	7.012
2	0.030	0.030	7.041	7.040
3	0.765	0.353	7.776	7.364
4	0.732	0.278	7.743	7.288
5	0.711	0.483	7.722	7.494
6	0.696	1.221	7.707	8.232
7	0.681	1.225	7.692	8.236
8	1.837	1.223	8.848	8.234
9	1.781	1.132	8.792	8.143
10	1.593	0.001	8.604	7.012
11	1.401	1.131	8.412	8.142
12	1.036		8.047	

RPM=1120   H=56.45   P=48.33   P (psi) = 7.009
Fri   May   13   15:12:18   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.002	0.001	7.011	7.010
2	0.030	0.030	7.039	7.039
3	0.796	0.368	7.806	7.378
4	0.764	0.288	7.773	7.297
5	0.739	0.504	7.749	7.513
6	0.722	1.270	7.731	8.280
7	0.708	1.274	7.718	8.283
8	1.912	1.271	8.921	8.280
9	1.851	1.178	8.861	8.188
10	1.659	0.001	8.668	7.010
11	1.460	1.177	8.470	8.186
12	1.077		8.086	

RPM=1140   H=56.78   P=48.35   P (psi) = 7.012
Fri   May   13   15:14:25   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.002	0.001	7.014	7.013
2	0.030	0.030	7.042	7.042
3	0.823	0.382	7.835	7.394
4	0.787	0.299	7.799	7.312
5	0.761	0.523	7.774	7.535
6	0.745	1.313	7.757	8.326
7	0.733	1.318	7.745	8.330
8	1.976	1.315	8.988	8.328
9	1.913	1.220	8.925	8.232
10	1.719	0.001	8.732	7.013
11	1.511	1.218	8.523	8.231
12	1.108		8.121	

RPM=1160   H=57.09   P=48.38   P (psi) = 7.017
Fri   May   13   15:16:14   1994

Transducer	Average (psid) sc-01	sc-02	Average (psia) sc-01	sc-02
1	0.002	0.001	7.018	7.018
2	0.030	0.030	7.047	7.046
3	0.850	0.396	7.866	7.413
4	0.811	0.310	7.827	7.326
5	0.787	0.540	7.803	7.557
6	0.768	1.359	7.785	8.376
7	0.754	1.364	7.771	8.380
8	2.038	1.362	9.055	8.379
9	1.984	1.263	9.001	8.280
10	1.784	0.001	8.801	7.018
11	1.565	1.262	8.582	8.278
12	1.151		8.168	

RPM=0	H=53.51	P=53.51	P (psi) = 7.761	
Fri	May	13	15:20:01	1994
	Average (psid)		Average (psia)	
Transducer	sc-01	sc-02	sc-01	sc-02
1	0.001	0.000	7.761	7.760
2	0.025	0.025	7.786	7.785
3	0.001	0.001	7.762	7.761
4	0.000	0.000	7.761	7.761
5	0.000	0.001	7.761	7.761
6	0.001	0.001	7.761	7.761
7	0.000	0.001	7.761	7.762
8	0.001	0.000	7.761	7.761
9	0.000	0.000	7.761	7.761
10	0.001	0.000	7.762	7.761
11	0.001	0.001	7.761	7.761
12	0.001		7.761	

A.4 Pressure Coefficients – Nozzle Comparison (MAX1, MAX2)

	MAX1			MAX2		
	Nozzle 1	Nozzle 2	Nozzle 3	Nozzle 1	Nozzle 2	Nozzle 3
R1T1	0.694	0.686	0.676	0.691	0.685	0.678
R1T2	0.674	0.667	0.648	0.671	0.666	0.650
R1T3	0.660	0.654	0.628	0.659	0.653	0.629
R1T4	0.648	0.642	0.614	0.647	0.641	0.615
R1T5	0.636	0.629	0.602	0.634	0.628	0.603
R2T1	1.380	1.446	1.626	1.383	1.448	1.625
R2T2	1.382	1.435	1.574	1.383	1.438	1.572
R2T3	1.263	1.302	1.409	1.264	1.303	1.407
R2T4	1.154	1.177	1.239	1.156	1.178	1.237
R2T5	0.929	0.922	0.915	0.928	0.922	0.914
B1	0.446	0.408	0.310	0.442	0.406	0.311
A1	0.398	0.354	0.244	0.394	0.351	0.245
B2	0.524	0.496	0.425	0.521	0.494	0.426
B3	1.054	1.061	1.079	1.055	1.062	1.078
A3	1.058	1.064	1.083	1.058	1.065	1.082
A4	1.055	1.061	1.080	1.056	1.063	1.079
SC	1.001	1.000	1.001	1.001	1.001	1.000
PC	0.001	0.001	0.001	0.001	0.001	0.001
TOT	1.000	1.000	1.000	1.000	1.000	1.000

A.5 Temperature and Flow Rate Data

Date: 9/05/1994
Test: N1 INCR

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
13:51	0	49.60	49.60	0.000	14.7	15.0	12.1	12.6	11.8	10.8	9.0	10.7	16.9	16.6	16.2	16.5	16.5	16.5	58.0	61.0	55.8
14:10	400	50.38	49.16	0.190	17.1	17.5	16.3	16.9	16.7	16.9	16.1	16.6	17.0	16.8	16.4	16.7	16.7	16.6	57.0	60.0	56.6
14:25	420	51.01	49.65	0.197	18.4	18.7	18.3	18.7	17.2	17.4	16.6	17.1	17.1	16.9	17.2	17.3	17.0	16.9	58.0	61.0	55.3
14:30	440	51.23	49.69	0.209	18.5	18.9	18.4	18.9	17.3	17.5	16.7	17.2	17.1	16.9	17.3	17.5	17.1	17.0			55.1
14:31	460	51.38	49.72	0.219	18.7	19.1	18.7	19.1	17.4	17.6	16.8	17.3	17.1	16.9	17.5	17.6	17.2	17.0	57.0	60.0	55.3
14:34	480	51.53	49.70	0.229	18.9	19.4	18.9	19.3	17.4	17.7	16.9	17.4	17.0	16.9	17.6	17.7	17.3	17.1			55.8
14:36	500	51.69	49.69	0.239	19.2	19.6	19.2	19.6	17.6	17.8	17.0	17.5	17.1	17.0	17.7	17.8	17.3	17.1	57.0	60.0	56.6
14:38	520	51.83	49.67	0.249	19.5	19.9	19.4	19.8	17.7	17.9	17.1	17.6	17.1	17.0	17.9	18.0	17.4	17.2			55.6
14:40	540	52.00	49.65	0.259	19.8	20.2	19.8	20.2	17.8	18.1	17.3	17.8	17.1	17.0	18.1	18.1	17.5	17.2			56.3
14:43	560	52.20	49.63	0.269	20.2	20.7	20.2	20.6	18.0	18.3	17.5	18.0	17.2	17.0	18.3	18.3	17.6	17.4	56.0	59.0	56.6
14:47	580	52.37	49.61	0.280	20.5	21.0	20.6	20.9	18.2	18.5	17.7	18.2	17.2	17.0	18.5	18.5	17.8	17.5			55.8
14:49	600	52.59	49.62	0.290	21.0	21.5	21.0	21.4	18.4	18.8	17.9	18.4	17.2	17.1	18.8	18.7	18.0	17.7	56.5	59.5	55.8
14:50	620	52.82	49.65	0.300	21.6	22.1	21.6	21.9	18.8	19.2	18.3	18.8	17.2	17.1	19.2	19.0	18.3	17.9			55.6
14:54	640	53.07	49.65	0.311	22.1	22.6	22.1	22.5	19.1	19.5	18.6	19.1	17.3	17.2	19.6	19.4	18.5	18.1	56.0	59.0	56.3
14:56	660	53.30	49.61	0.322	22.6	23.1	22.6	23.0	19.4	19.8	18.9	19.4	17.3	17.2	19.9	19.6	18.7	18.3			55.3
15:00	680	53.50	49.61	0.331	23.1	23.7	23.2	23.5	19.7	20.1	19.2	19.7	17.3	17.2	20.2	19.9	19.0	18.4	56.0	59.0	55.6
15:02	700	53.71	49.57	0.341	23.6	24.2	23.7	24.0	19.9	20.4	19.4	20.0	17.3	17.2	20.2	20.2	19.1	18.5	55.5	58.5	55.8
15:04	720	53.94	49.54	0.352	24.1	24.7	24.3	24.6	20.3	20.7	19.8	20.4	17.4	17.3	20.9	20.5	19.3	18.7			55.8
15:06	740	54.16	49.51	0.361	24.7	25.3	24.8	25.1	20.5	21.0	20.0	20.6	17.4	17.3	21.3	20.8	19.5	18.8	56.0	59.0	56.1
15:08	760	54.40	49.43	0.373	25.3	25.8	25.4	25.7	20.9	21.3	20.3	20.9	17.4	17.4	21.7	21.1	19.7	19.0			56.1
15:11	780	54.66	49.36	0.384	25.9	26.5	26.0	26.4	21.2	21.7	20.7	21.3	17.5	17.4	22.1	21.5	20.0	19.1			56.1
15:14	800	54.89	49.35	0.393	26.5	27.1	26.6	27.0	21.6	22.1	21.1	21.7	17.5	17.5	22.5	21.9	20.2	19.3	56.0	59.0	56.6
15:17	820	55.26	49.38	0.404	27.5	28.1	27.6	27.9	22.1	22.7	21.6	22.2	17.6	17.6	23.3	22.5	20.6	19.6			56.3
15:20	840	55.50	49.35	0.414	28.1	28.7	28.3	28.6	22.5	23.0	22.0	22.6	17.7	17.6	23.7	22.5	20.8	19.8	55.5	58.5	56.8
15:23	860	55.76	49.30	0.424	28.7	29.4	29.0	29.3	22.9	23.5	22.4	23.0	17.8	17.7	24.2	23.2	21.1	20.0			56.8
15:25	880	56.06	49.26	0.435	29.7	30.3	29.8	30.1	23.4	24.0	22.9	23.5	17.8	17.7	24.8	23.7	21.4	20.2	55.5	58.5	57.1
15:28	900	56.35	49.19	0.445	30.4	31.1	30.6	30.9	23.9	24.4	23.3	24.0	17.9	17.8	25.4	24.1	21.7	20.4			56.8
15:30	920	56.64	49.15	0.455	31.1	31.8	31.3	31.6	24.3	24.9	23.8	24.4	17.9	17.9	25.8	24.6	22.0	20.5			57.1
15:32	940	56.90	49.09	0.465	32.0	32.6	32.2	32.5	24.8	25.4	24.3	25.0	18.0	18.0	26.4	25.1	22.3	20.8	56.0	59.0	56.8
15:35	960	57.19	49.03	0.474	32.8	33.5	33.0	33.3	25.3	26.0	24.8	25.5	18.1	18.1	27.1	25.6	22.6	21.0			57.8
15:38	980	57.52	48.98	0.485	33.7	34.4	33.8	34.2	25.8	26.5	25.3	26.0	18.2	18.2	27.6	26.1	23.0	21.2			56.3
15:40	1000	57.81	48.90	0.495	34.5	35.3	34.8	35.1	26.3	27.1	25.8	26.6	18.3	18.3	28.2	26.5	23.3	21.5	56.0	59.0	56.8
15:42	1020	58.12	48.80	0.505	35.4	36.2	35.7	36.0	26.9	27.7	26.4	27.1	18.3	18.3	28.9	27.1	23.8	21.8			57.1
15:44	1040	58.42	48.79	0.515	36.4	37.2	36.7	37.0	27.5	28.3	27.0	27.8	18.5	18.5	29.6	27.7	24.1	22.0	55.0	58.0	57.8
15:46	1060	58.80	48.77	0.525	37.5	38.2	37.8	38.0	28.2	29.0	27.6	28.4	18.6	18.6	30.4	28.4	24.1	21.8			57.1
15:49	1080	59.07	48.62	0.535	38.2	38.9	38.5	38.7	28.4	29.3	28.0	28.8	18.7	18.7	31.0	29.0	24.7	22.3	56.0	59.0	57.8
15:51	1100	59.37	48.48	0.546	39.1	39.8	39.3	39.6	28.7	29.6	28.2	29.1	18.8	18.8	31.6	29.4	24.4	21.9			57.3
15:54	1120	59.77	48.44	0.555	40.1	40.9	40.4	40.6	29.5	30.3	28.9	29.7	18.9	18.8	32.5	30.3	24.7	22.0	55.0	58.5	56.8
15:55	1140	60.13	48.40	0.567	41.1	41.9	41.4	41.6	29.8	30.7	29.3	29.7	19.1	19.2	33.4	31.0	25.0	22.2			57.3
15:58	1160	60.50	48.33	0.577	42.1	42.9	42.4	42.6	30.6	31.6	30.2	31.0	19.2	19.3	34.0	31.5	25.5	22.3	55.0	58.0	56.6
16:04	0	56.05	56.05	0.000	35.0	35.3	35.5	35.6	25.0	25.1	24.6	24.9	19.3	19.2	33.2	31.4	22.0	21.9			57.3

Date: 10/05/1994
Test: N1 MAX1

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
9:40	0	48.40	48.40	0.000	14.2	14.7	12.6	13.0	15.6	14.6	13.5	14.5	17.6	17.4	16.5	16.9	17.3	17.3			57.3
9:45	1100	53.30	43.32	0.551	31.0	32.2	31.1	31.5	22.9	23.8	22.5	23.3	17.7	17.5	21.4	20.2	19.7	17.7	55.0	57.0	57.8
9:50	1100	53.82	43.72	0.553	34.1	35.1	34.6	34.7	24.3	25.2	23.9	24.7	17.8	17.7	25.5	24.0	20.7	18.6			57.1
9:55	1100	54.50	44.36	0.549	36.2	37.1	36.7	36.7	25.9	26.7	25.5	26.3	18.1	18.0	28.8	27.1	22.1	19.9	53.0	54.5	57.5
10:00	1100	54.89	44.78	0.547	37.3	38.1	37.7	37.9	26.9	27.8	26.4	27.3	18.4	18.3	30.3	28.5	23.1	20.8			57.8
10:05	1100	55.22	45.02	0.548	38.2	39.0	38.6	38.7	27.7	28.5	27.2	28.0	18.5	18.5	31.3	29.4	23.8	21.5	55.0	58.0	57.8
10:10	1100	55.60	45.40	0.546	39.0	39.8	39.4	39.6	28.5	29.3	28.0	28.8	18.8	18.8	32.2	30.2	24.5	22.0			57.5
10:15	1100	55.85	45.63	0.546	39.5	40.3	39.9	40.0	28.7	29.4	28.0	28.9	19.0	19.0	32.8	30.8	24.4	22.0			57.8
10:20	1100	56.08	45.82	0.546	39.6	40.4	40.1	40.2	28.7	29.5	28.2	29.0	19.3	19.3	33.5	31.3	24.5	22.0	55.0	57.5	57.8
10:25	1100	56.33	46.10	0.544	39.8	40.6	40.2	40.4	28.8	29.6	28.3	29.1	19.5	19.6	33.9	31.6	24.5	22.1			57.5
10:30	1100	56.61	46.30	0.544	40.1	40.8	40.5	40.6	29.0	29.8	28.4	29.2	19.7	19.8	34.2	32.0	24.6	22.0	54.0	55.0	57.5
10:35	1100	56.92	46.51	0.544	40.4	41.1	40.7	40.9	29.5	30.4	29.0	29.8	20.0	20.1	34.5	32.2	25.1	22.4			57.3
10:40	1100	57.10	46.65	0.547	40.4	41.1	40.8	41.0	29.2	30.0	28.6	29.5	20.2	20.3	34.7	32.5	24.7	22.1	55.0	58.0	57.1
10:45	1100	57.34	46.88	0.546	40.6	41.4	41.0	41.2	29.6	30.5	29.0	29.8	20.4	20.5	34.9	32.6	25.1	22.3			57.1
10:50	1100	57.52	47.07	0.543	40.6	41.3	40.9	41.1	29.3	30.1	28.8	29.6	20.6	20.7	35.1	32.8	24.8	22.1	55.0	57.0	57.3
10:55	1100	57.75	47.28	0.543	40.7	41.4	41.0	41.2	29.6	30.4	29.0	29.8	20.8	20.9	35.1	32.9	24.9	22.1			58.0
11:00	1100	57.94	47.44	0.543	40.7	41.4	41.0	41.2	29.3	30.1	28.7	29.5	21.0	21.1	35.2	33.0	24.7	22.0	55.0	57.0	57.5
11:05	1100	58.18	47.63	0.543	40.8	41.5	41.1	41.3	29.6	30.5	29.2	29.9	21.2	21.3	35.4	33.1	25.2	22.4			58.3
11:10	1100	58.41	47.83	0.542	40.9	41.6	41.2	41.4	29.5	30.3	29.0	29.8	21.4	21.5	35.5	33.3	24.9	22.1	55.0	57.5	58.0
11:15	1100	58.71	47.98	0.545	41.2	41.9	41.5	41.7	29.7	30.6	29.2	30.0	21.6	21.7	35.7	33.4	24.9	22.2			58.7
11:20	1100	58.88	48.20	0.544	41.1	41.8	41.4	41.7	29.6	30.5	29.0	29.9	21.8	21.9	35.8	33.6	24.9	22.1	55.0	57.0	57.5
11:25	1100	59.14	48.32	0.544	41.2	41.9	41.5	41.7	29.6	30.5	29.1	29.9	22.0	22.1	35.8	33.6	24.9	22.1			58.3
11:30	1100	59.33	48.51	0.545	41.3	42.0	41.6	41.9	29.8	30.6	29.2	30.0	22.1	22.3	35.9	33.7	25.0	22.2	55.0	57.0	58.0
11:35	1100	59.56	48.70	0.544	41.5	42.1	41.8	42.0	29.9	30.8	29.4	30.2	22.3	22.4	36.1	33.8	25.1	22.3			57.3
11:40	1100	59.76	48.90	0.542	41.5	42.2	41.8	42.0	30.0	30.8	29.4	30.2	22.5	22.6	36.2	33.9	25.2	22.4	55.0	57.0	58.3
11:45	1100	59.97	49.04	0.543	41.5	42.1	41.8	42.0	30.0	30.8	29.4	30.3	22.6	22.7	36.2	34.0	25.2	22.3			57.8
11:50	1100	60.27	49.34	0.543	41.6	42.3	42.0	42.2	30.1	31.0	29.5	30.4	22.8	22.9	36.3	34.0	25.3	22.4	55.0	57.5	58.0
11:55	1100	60.57	49.53	0.543	41.7	42.4	42.0	42.2	30.1	31.0	29.6	30.4	22.9	23.0	36.4	34.1	25.2	22.2			57.5
12:00	1100	60.89	49.85	0.541	41.6	42.3	41.9	42.2	30.1	30.9	29.5	30.4	23.1	23.2	36.5	34.2	25.1	22.2	54.5	58.0	58.7
12:05	1100	61.12	50.08	0.542	41.8	42.5	42.1	42.4	30.4	31.4	30.0	30.8	23.2	23.3	36.6	34.4	25.4	22.4			57.3
12:10	1100	61.46	50.30	0.543	41.7	42.4	42.1	42.3	30.2	31.2	29.8	30.6	23.4	23.5	36.6	34.4	25.6	22.6	55.0	58.0	58.3
12:15	1100	61.76	50.58	0.543	41.7	42.4	42.1	42.3	30.3	31.1	29.7	30.5	23.5	23.6	36.6	34.5	25.1	22.2			57.1
12:20	1100	62.00	58.85	0.540	41.8	42.5	42.1	42.4	30.3	31.2	29.7	30.6	23.6	23.7	36.7	34.5	25.3	22.3	55.0	58.0	58.7
12:25	1100	62.29	51.02	0.542	41.8	42.5	42.1	42.4	30.3	31.2	29.7	30.6	23.7	23.8	36.7	34.5	25.2	22.2			58.5
12:30	1100	62.59	51.20	0.544	41.8	42.5	42.1	42.5	30.5	31.3	29.9	30.8	23.8	23.9	36.8	34.6	25.2	22.3	55.0	58.0	58.7
12:35	1100	62.85	51.52	0.541	42.0	42.7	42.4	42.5	30.5	31.3	29.9	30.8	23.9	24.1	36.9	34.8	25.2	22.3			58.3
12:40	0	58.97	59.00	0.001	36.3	36.7	36.7	36.8	26.1	26.3	25.8	26.1	24.0	23.9	35.9	34.0	22.2	22.2	55.0	57.0	58.7
12:45	0	59.28	59.30	0.001	35.2	35.6	34.1	34.3	26.7	26.7	25.9	26.4	23.9	23.8	35.2	33.6	22.3	22.3	56.0	57.5	
13:45	0	61.13	61.16	0.001	26.8	27.2	24.5	25.0	26.1	25.6	25.0	25.5	23.4	23.4	29.1	28.3	21.9	21.9			

Date: 10/05/1994
Test: N1 MAX2

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)
18:25	0	48.33	48.33	0.000	16.8	17.3	15.1	15.6	18.7	17.5	16.1	17.4	21.6	21.7	20.8	21.1	18.9	19.0	50.0	53.0
18:30	1107	52.67	42.85	0.553	28.2	29.8	28.0	29.3	23.7	24.8	23.5	24.2	21.5	21.6	23.0	22.2	21.0	19.0	49.5	53.0
18:35	1100	53.12	43.30	0.550	34.7	35.6	34.9	35.2	25.1	26.0	24.7	25.5	21.5	21.6	26.1	24.7	21.6	19.6	49.0	52.5
18:40	1100	53.55	43.62	0.550	36.6	37.4	36.9	37.1	26.2	27.1	25.8	26.6	21.6	21.7	28.9	27.2	22.5	20.3	49.0	53.0
18:45	1100	53.97	44.10	0.546	37.7	38.5	38.1	38.2	27.2	28.1	26.7	27.5	21.7	21.8	30.8	29.0	23.4	21.1	48.5	51.5
18:50	1100	54.31	44.34	0.546	38.6	39.3	38.9	39.1	27.9	28.8	27.4	28.2	21.9	21.8	31.9	29.9	24.0	21.7	49.0	52.0
18:55	1100	54.65	44.66	0.545	39.4	40.1	39.7	39.9	28.5	29.3	27.9	28.8	22.0	21.9	32.9	30.7	24.1	21.8	49.0	52.5
19:00	1100	54.89	44.89	0.546	39.5	40.3	39.9	40.1	28.7	29.6	28.2	29.0	22.0	22.0	33.4	31.3	24.8	22.2	49.0	52.5
19:05	1100	55.18	45.08	0.545	40.0	40.6	40.2	40.4	28.6	29.4	28.0	28.9	22.1	22.1	33.9	31.7	24.4	22.2	49.0	52.5
19:10	1100	55.49	45.36	0.544	40.2	40.9	40.5	40.7	29.1	30.0	28.6	29.4	22.2	22.3	34.2	32.0	24.8	22.1	49.0	52.0
19:15	1100	55.71	45.55	0.545	40.4	41.0	40.6	40.8	28.9	29.7	28.3	29.2	22.3	22.3	34.5	32.2	24.4	21.9	49.0	52.0
19:20	1100	55.95	45.75	0.544	40.3	41.0	40.6	40.8	29.0	29.9	28.6	29.4	22.4	22.5	34.7	32.5	25.1	22.5	49.0	53.0
19:25	1100	56.24	46.02	0.544	40.6	41.2	40.8	41.1	29.4	30.3	28.9	29.7	22.5	22.6	34.9	32.6	24.9	22.1	49.5	53.5
19:30	1100	56.41	46.17	0.543	40.5	41.1	40.7	40.9	29.0	29.8	28.4	29.3	22.6	22.7	35.0	32.7	24.7	22.3	50.0	53.5
19:35	1100	56.66	46.41	0.543	40.5	41.3	40.8	41.0	29.1	30.0	28.6	29.4	22.7	22.8	35.2	33.0	25.1	22.5	50.0	53.5
19:40	1100	56.92	46.60	0.542	40.6	41.2	40.9	41.1	29.1	30.0	28.6	29.4	22.9	22.9	35.4	33.4	24.6	21.9		
19:45	1100	57.14	46.79	0.542	40.7	41.4	41.0	41.2	29.2	30.0	28.6	29.4	23.0	23.0	35.5	33.6	24.6	22.0	50.0	53.5
19:50	1100	57.38	46.97	0.542	40.8	41.4	41.1	41.3	29.2	30.1	28.7	29.5	23.1	23.1	35.6	33.6	24.6	21.9	50.0	53.5
19:55	1100	57.63	47.22	0.542	40.9	41.6	41.3	41.4	29.5	30.5	29.1	29.9	23.2	23.2	35.6	33.6	25.1	22.3		
20:00	1100	57.85	47.42	0.541	40.9	41.6	41.3	41.5	29.5	30.4	29.0	29.9	23.3	23.3	35.8	33.7	25.3	22.5	50.0	53.0
20:05	1100	58.14	47.66	0.542	41.1	41.8	41.4	41.7	29.8	30.7	29.3	30.1	23.4	23.4	35.9	34.0	25.0	22.2		
20:10	1100	58.37	47.75	0.542	41.2	41.8	41.5	41.7	29.6	30.4	29.0	29.9	23.5	23.6	35.9	33.9	24.9	22.3	50.5	53.5
20:15	1100	58.58	47.95	0.543	41.2	41.8	41.5	41.7	29.6	30.4	29.0	29.9	23.6	23.7	36.0	34.0	24.9	22.1		
20:20	1100	58.81	48.20	0.541	41.2	41.9	41.6	41.7	29.6	30.5	29.0	29.9	23.7	23.8	36.0	34.0	25.0	22.3	50.5	54.0
20:25	1100	59.07	48.43	0.541	41.3	42.0	41.6	41.9	30.0	30.9	29.5	30.2	23.8	23.8	36.1	34.1	24.9	22.2		
20:30	1100	59.31	48.55	0.541	41.4	42.1	41.7	41.9	29.9	30.7	29.2	30.1	23.9	23.9	36.1	34.2	25.1	22.5	50.0	53.0
20:35	1100	59.50	48.72	0.543	41.4	42.0	41.7	41.8	29.7	30.6	29.2	30.0	24.0	24.0	36.2	34.2	25.1	22.2		
20:40	1100	59.77	49.00	0.540	41.5	42.2	41.8	42.0	30.0	30.8	29.4	30.3	24.1	24.1	36.2	34.2	25.0	22.1	51.0	54.0
20:45	1100	60.01	49.08	0.543	41.6	42.3	41.9	42.1	30.0	30.8	29.4	30.3	24.2	24.2	36.3	33.9	25.1	22.5		
20:50	1100	60.22	49.27	0.544	41.7	42.3	42.0	42.2	30.0	30.8	29.4	30.3	24.3	24.3	36.3	34.0	25.2	22.5		
20:55	1100	60.42	49.50	0.542	41.6	42.2	41.9	42.1	29.9	30.8	29.4	30.2	24.4	24.4	36.3	33.9	25.0	22.1	50.0	53.5
21:00	1100	60.61	49.67	0.541	41.6	42.2	41.9	42.1	30.0	30.8	29.4	30.2	24.4	24.4	36.3	33.9	25.6	22.6	50.5	53.5
21:05	1100	60.85	49.90	0.540	41.5	42.2	41.9	42.1	30.1	31.1	29.7	30.5	24.5	24.5	36.6	34.6	25.5	22.5		
21:10	1100	61.08	50.02	0.541	41.6	42.3	41.9	42.2	30.1	31.1	29.7	30.5	24.6	24.6	36.7	34.7	25.1	22.2	51.0	54.0
21:15	1100	61.34	50.25	0.540	41.7	42.4	42.1	42.3	30.2	31.1	29.6	30.5	24.7	24.7	36.7	34.8	25.1	22.1	52.0	54.0
21:20	1100	61.51	50.40	0.541	41.5	42.2	41.9	42.1	30.1	30.9	29.5	30.3	24.7	24.7	36.7	34.8	25.0	22.1	52.0	54.0
21:25	1100	61.77	50.59	0.542	41.7	42.5	42.2	42.4	30.2	31.1	29.7	30.5	24.8	24.8	36.8	34.9	25.1	22.1	52.0	55.0
21:30	1100	61.97	50.75	0.542	41.7	42.5	42.1	42.3	30.2	31.0	29.6	30.5	24.9	24.9	36.9	34.9	25.1	22.2	52.0	54.0
21:35	0	58.28	58.28	0.000	34.2	35.4	35.1	35.3	26.1	26.2	25.7	26.0	24.9	24.8	35.4	33.8	21.8	21.9		

Date: 11/5/94
Test: N2 INCR

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
14:05	0	48.20	48.20	0.000	11.7	14.7	11.1	11.6	13.7	12.8	10.8	12.7	19.3	19.2	17.4	17.8	18.6	18.7	51.0	55.5	57.1
14:10	400	49.26	48.17	0.180	14.2	18.4	16.9	17.4	18.6	18.8	18.0	18.5	19.3	19.2	17.8	18.1	18.7	18.7	52.0	55.0	56.6
14:12	420	49.41	48.20	0.189	16.9	19.2	18.3	18.8	18.7	18.9	18.1	18.7	19.3	19.2	18.1	18.3	18.7	18.7	52.0	55.0	57.3
14:15	440	49.58	48.23	0.200	17.6	19.6	19.1	19.4	18.8	19.0	18.2	18.8	19.3	19.2	18.3	18.5	18.8	18.7	51.5	55.0	57.5
14:17	460	49.72	48.24	0.208	17.3	20.1	19.6	19.9	18.9	19.1	18.3	18.9	19.3	19.2	18.5	18.7	18.8	18.7			57.5
14:20	480	49.92	48.29	0.219	16.5	20.4	20.0	20.3	19.0	19.2	18.4	19.0	19.3	19.2	18.8	19.0	18.9	18.8	51.5	55.5	57.5
14:23	500	50.10	48.30	0.230	17.2	20.8	20.3	20.6	19.1	19.3	18.5	19.1	19.3	19.2	19.0	19.3	19.0	18.8			57.5
14:25	520	50.27	48.33	0.238	19.5	21.1	20.6	20.9	19.2	19.4	18.6	19.2	19.4	19.2	19.2	19.4	19.1	18.8	51.5	56.0	57.5
14:28	540	50.47	48.37	0.248	19.2	21.4	21.0	21.3	19.3	19.5	18.8	19.3	19.3	19.2	19.5	19.6	19.2	18.9			57.8
14:30	560	50.67	48.38	0.258	19.7	21.8	21.4	21.7	19.5	19.7	18.9	19.4	19.3	19.2	19.7	19.8	19.3	18.9	51.5	56.0	57.8
14:34	580	50.85	48.39	0.268	21.1	22.2	21.7	22.0	19.6	19.8	19.1	19.6	19.3	19.2	19.9	20.0	19.3	19.0			57.3
14:36	600	51.03	48.38	0.277	21.0	22.6	22.1	22.5	19.8	20.0	19.2	19.8	19.2	19.2	20.2	20.3	19.4	19.0	51.5	56.0	57.5
14:38	620	51.24	48.38	0.289	21.4	23.0	22.5	22.8	19.9	20.2	19.4	19.9	19.2	19.2	20.4	20.4	19.5	19.1			57.5
14:41	640	51.43	48.37	0.298	21.6	23.4	23.0	23.3	20.1	20.4	19.5	20.1	19.2	19.2	20.7	20.6	19.7	19.2			58.3
14:44	660	51.62	48.36	0.307	21.3	23.8	23.3	23.6	20.3	20.6	19.7	20.3	19.3	19.2	21.0	20.9	19.8	19.2	52.0	56.0	58.3
14:46	680	51.83	48.37	0.317	23.4	24.3	23.9	24.2	20.5	20.8	20.0	20.6	19.3	19.2	21.3	21.1	19.9	19.3			58.3
14:48	700	52.04	48.35	0.327	24.1	24.8	24.4	24.7	20.7	21.1	20.2	20.8	19.3	19.2	21.6	21.4	20.1	19.4	52.0	56.0	57.8
14:52	720	52.35	48.41	0.336	24.8	25.6	25.1	25.4	21.1	21.4	20.5	21.2	19.3	19.2	22.1	21.8	20.4	19.5			57.3
14:55	740	52.62	48.41	0.346	25.4	26.1	25.7	25.9	21.4	21.8	20.9	21.5	19.3	19.2	22.6	22.2	20.5	19.7	53.0	57.5	58.0
14:57	760	52.91	48.48	0.357	26.0	26.8	26.3	26.6	21.7	22.1	21.2	21.8	19.4	19.2	23.1	22.5	20.7	19.8			57.8
15:02	780	53.17	48.50	0.366	26.7	27.3	26.9	27.1	22.0	22.4	21.4	22.1	19.4	19.3	23.4	22.8	20.9	19.9	53.5	58.0	58.0
15:04	800	53.40	48.46	0.376	27.2	27.8	27.4	27.7	22.2	22.7	21.7	22.4	19.4	19.3	23.7	23.1	21.1	20.0			58.3
15:07	820	53.65	48.44	0.386	27.8	28.5	28.0	28.3	22.6	23.0	22.0	22.7	19.5	19.3	24.1	23.4	21.4	20.1	53.0	57.5	58.0
15:09	840	53.91	48.41	0.396	28.5	29.2	28.7	29.0	23.0	23.4	22.4	23.1	19.5	19.3	24.5	23.8	21.6	20.3			58.3
15:12	860	54.19	48.39	0.405	29.2	29.9	29.4	29.7	23.3	23.8	22.8	23.5	19.6	19.4	25.0	24.1	21.9	20.5	53.5	58.0	57.3
15:14	880	54.47	48.37	0.415	30.0	30.7	30.2	30.5	23.8	24.3	23.2	23.9	19.6	19.4	25.5	24.6	22.2	20.6			57.8
15:17	900	54.77	48.32	0.425	30.7	31.4	31.2	31.5	24.3	24.9	23.8	24.5	19.7	19.5	26.2	25.2	22.5	20.9	53.0	58.0	57.8
15:20	920	55.10	48.46	0.433	31.7	32.4	31.9	32.2	24.8	25.4	24.2	25.0	19.8	19.5	26.8	25.7	22.8	21.1			57.5
15:24	940	55.44	48.41	0.444	32.5	33.2	32.8	33.0	25.2	25.9	24.7	25.5	19.9	19.6	27.4	26.3	23.1	21.3	52.5	57.0	58.0
15:26	960	55.72	48.44	0.451	33.2	33.9	33.4	33.7	25.7	26.3	25.2	25.9	19.9	19.6	27.9	26.6	23.5	21.4	52.5	57.0	57.8
15:29	980	56.04	48.41	0.465	34.3	35.1	34.6	34.9	26.3	27.0	25.8	26.5	20.0	19.7	28.7	27.3	23.8	21.7			58.0
15:32	1000	56.38	48.44	0.472	35.1	35.8	35.3	35.6	26.8	27.5	26.3	27.0	20.1	19.8	29.3	27.8	24.2	21.9	52.5	57.0	57.1
15:34	1020	56.70	48.38	0.482	35.9	36.7	36.2	36.5	27.3	28.1	26.8	27.6	20.2	19.9	29.9	28.4	24.2	22.2			58.0
15:37	1040	57.03	48.40	0.490	36.9	37.7	37.2	37.4	27.6	28.3	27.0	27.8	20.3	19.9	30.5	28.9	23.9	22.1	52.0	57.0	57.8
15:40	1060	57.35	48.35	0.501	37.6	38.4	37.9	38.2	28.1	28.8	27.5	28.3	20.4	20.0	31.1	29.3	24.4	21.7			57.5
15:42	1080	57.67	48.30	0.510	38.4	39.2	38.7	39.0	28.6	29.5	28.2	29.0	20.5	20.1	31.4	29.6	24.4	21.9	52.0	57.0	57.5
15:44	1100	57.90	48.18	0.520	39.1	39.9	39.4	39.7	28.8	29.7	28.4	29.3	20.6	20.2	32.2	30.3	24.9	22.4			57.5
15:46	1120	58.24	48.10	0.530	40.1	40.9	40.5	40.7	29.1	30.1	28.7	29.6	20.7	20.3	33.0	31.0	25.0	22.4	52.5	57.5	57.8
15:49	1140	58.60	48.09	0.537	41.1	41.8	41.4	41.6	29.8	30.7	29.3	30.2	20.8	20.4	33.7	31.6	25.3	22.1			58.0
15:52	1160	58.95	48.00	0.549	41.9	42.7	42.2	42.4	30.2	31.1	29.6	30.5	20.9	20.5	34.3	32.1	25.0	22.4			58.0
15:55	0	54.40	54.90	0.000	36.0	36.4	36.7	36.8	25.8	26.2	25.6	25.9		20.5	33.6	34.9	22.5	22.1	53.0	58.0	58.0
16:00	0	55.12	55.12	0.000	33.2	33.5	32.1	32.2	25.5	25.4	24.5	25.1		20.5	32.5	31.0	22.0	22.0			58.3

Date: 12/05/1994
Test: N2 MAX1

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
10:10	0	48.08	48.08	0.000	12.3	12.8	9.2	9.7	11.9	11.0	9.0	10.8	18.0	17.7	16.3	16.7	16.0	16.1	53.0	54.5	57.5
10:20	1100	52.65	43.52	0.532	25.9	27.6	25.7	26.9	20.9	22.0	20.8	21.5	18.0	17.7	19.0	18.4	18.2	16.2			57.8
10:25	1100	53.26	44.15	0.526	32.6	33.5	33.0	33.1	22.9	23.7	22.5	23.3	18.1	17.8	23.8	22.6	19.3	17.1	50.0	52.0	57.8
10:30	1100	53.75	44.58	0.526	34.3	35.1	34.8	34.8	24.1	24.9	23.6	24.5	18.2	17.9	26.6	25.4	20.3	18.0			58.0
10:35	1100	54.08	44.82	0.524	35.2	36.0	35.6	35.8	24.9	25.7	24.4	25.2	18.3	18.0	28.0	26.6	21.0	18.7	50.0	52.5	57.5
10:40	1100	54.47	45.26	0.522	36.0	36.9	36.5	36.7	25.8	26.6	25.3	26.1	18.4	18.2	29.4	27.9	21.9	19.6			58.0
10:45	1100	54.94	45.60	0.522	37.4	38.3	37.8	38.0	26.8	27.7	26.4	27.2	18.6	18.4	30.6	29.0	22.9	20.5	50.0	53.0	57.5
10:50	1100	55.26	45.96	0.520	38.1	38.9	38.6	38.7	27.6	28.5	27.2	28.0	18.8	18.6	31.5	29.6	23.7	21.3			58.3
10:55	1100	55.70	46.35	0.519	39.2	40.0	39.6	39.8	28.6	29.4	28.1	28.9	19.0	18.8	32.5	30.6	24.7	22.2	50.5	53.5	57.5
11:00	1100	56.00	46.61	0.519	39.7	40.5	40.1	40.3	28.7	29.5	28.2	29.0	19.3	19.0	33.3	31.4	24.7	22.4			57.5
11:05	1100	56.29	46.87	0.519	40.0	40.8	40.4	40.4	29.0	29.8	28.5	29.3	19.5	19.2	33.8	31.8	24.8	22.3	51.0	54.0	58.3
11:10	1100	56.56	47.10	0.519	40.3	41.0	40.6	40.8	29.2	30.0	28.7	29.5	19.7	19.4	34.2	32.2	25.2	22.7			57.5
11:15	1100	56.84	47.35	0.518	40.5	41.2	40.8	41.0	29.3	30.1	28.7	29.5	20.0	19.6	34.5	32.5	24.9	22.5	51.0	54.0	57.8
11:20	1100	57.17	47.60	0.519	40.7	41.5	41.1	41.3	29.6	30.4	29.0	29.8	20.2	19.9	34.8	32.8	25.0	22.3			57.8
11:25	1100	57.39	47.78	0.520	40.8	41.6	41.3	41.4	29.5	30.3	28.9	29.7	20.4	20.1	35.0	33.1	24.9	22.3	51.0	54.5	58.3
11:30	1100	57.61	48.00	0.518	40.8	41.6	41.3	41.5	29.7	30.6	29.3	30.0	20.6	20.2	35.2	33.2	25.2	22.4			58.0
11:35	1100	57.87	48.20	0.518	40.8	41.6	41.3	41.5	29.7	30.6	29.2	30.0	20.8	20.4	35.4	33.4	25.5	22.7	51.0	54.5	58.0
11:40	1100	58.12	48.44	0.518	41.0	41.9	41.5	41.7	29.7	30.5	29.1	29.9	21.1	20.6	35.5	33.5	25.0	22.5			57.8
11:45	1100	58.40	48.70	0.517	41.0	41.9	41.5	41.7	30.0	30.9	29.5	30.3	21.3	20.8	35.7	33.5	25.3	22.4	51.5	55.0	57.3
11:50	1100	58.66	48.89	0.517	41.4	42.1	41.7	41.9	30.1	30.9	29.5	30.3	21.4	21.0	35.8	33.8	25.2	22.3			57.8
11:55	1100	58.83	49.02	0.517	41.2	42.0	41.6	41.9	29.8	30.7	29.3	30.1	21.6	21.2	35.9	33.9	25.1	22.3	51.5	55.0	58.0
12:00	1100	59.06	49.22	0.516	41.1	41.9	41.6	41.8	29.8	30.7	29.3	30.1	21.8	21.4	36.0	33.8	25.3	22.6			57.8
12:05	1100	59.35	49.46	0.517	41.3	42.2	41.8	42.0	29.9	30.7	29.3	30.2	22.1	21.6	36.1	34.0	25.3	22.7	52.0	57.0	57.5
12:10	1100	59.61	49.66	0.517	41.3	42.2	41.8	42.1	30.2	31.2	29.8	30.6	22.2	21.8	36.2	34.1	25.6	22.6			58.0
12:15	1100	59.78	49.85	0.516	41.4	42.2	41.9	42.1	30.0	30.9	29.4	30.2	22.4	21.9	36.2	34.1	25.1	22.3	53.0	57.0	58.0
12:20	1100	60.04	50.06	0.516	41.3	42.2	41.9	42.1	30.2	31.1	29.7	30.5	22.6	22.2	36.3	34.2	25.3	22.3			57.1
12:25	1100	60.29	50.24	0.517	41.6	42.3	42.0	42.2	30.1	30.9	29.5	30.4	22.7	22.3	36.4	34.2	25.1	22.3	52.0	56.0	58.3
12:30	1100	60.43	50.42	0.517	41.5	42.2	41.9	42.1	30.0	30.9	29.4	30.3	22.8	22.4	36.4	34.2	25.2	22.4			58.5
12:35	1100	60.77	50.64	0.517	41.8	42.6	42.2	42.4	30.4	31.3	29.8	30.6	23.0	22.5	36.5	34.3	25.3	22.2	53.0	57.0	58.0
12:40	1100	60.94	50.83	0.516	41.6	42.4	42.0	42.3	30.3	31.2	29.7	30.5	23.1	22.7	36.6	34.5	25.9	22.8			58.0
12:45	1100	61.22	51.07	0.515	41.7	42.6	42.2	42.7	30.3	31.2	29.8	30.5	23.3	22.8	36.7	34.4	25.2	22.2	53.0	57.0	58.7
12:50	1100	61.44	51.21	0.515	41.7	42.6	42.2	42.4	30.3	31.1	29.7	30.5	23.4	22.9	36.7	34.5	25.3	22.2			58.0
12:55	1100	61.75	51.57	0.515	42.3	43.3	42.9	43.1	31.4	32.5	31.1	31.9	23.6	23.1	36.9	34.6	27.2	22.2	54.0	57.0	40.9
13:00	1100	62.07	51.81	0.514	43.2	44.0	43.6	43.8	31.9	32.7	31.2	32.1	23.7	23.2	37.4	35.1	26.5	22.7			43.2
13:05	1100	62.06	51.81	0.516	43.2	43.0	42.7	42.9	30.7	31.6	30.2	31.0	23.8	23.4	37.2	35.2	25.9	22.8	54.0	58.0	55.8
13:10	1100	62.28	51.96	0.514	42.0	42.8	42.4	42.7	30.6	31.6	30.2	31.0	24.0	23.5	37.1	35.2	25.8	22.8			57.8
13:15	0	58.68	58.70	0.000	36.0	36.5	36.5	36.6	25.9	26.2	25.7	25.8	23.9	23.4	36.0	34.4	22.3	22.3			57.1

Date: 12/05/1994
Test: N2 MAX2

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
18:25	0	47.88	17.88	0.000	16.1	16.6	13.7	14.3	17.2	16.2	14.4	16.0	22.1	22.2	21.3	21.6	18.5	18.6	48.0	50.0	59.0
18:30	1100	52.32	43.05	0.528	30.3	31.9	30.4	31.4	23.8	24.8	23.5	24.3	21.9	22.1	24.0	23.2	20.6	18.6	48.0	51.0	59.0
18:35	1100	52.58	43.55	0.526	33.8	34.0	34.3	34.4	24.5	25.3	24.1	24.9	21.9	22.0	24.9	24.8	21.0	18.8	48.0	50.5	59.0
18:40	1100	52.96	44.00	0.521	35.7	36.7	36.3	36.4	25.6	26.4	25.2	26.0	21.9	22.0	28.6	27.3	21.9	19.7			58.5
18:45	1100	53.34	44.31	0.523	37.0	37.9	37.5	37.5	26.5	27.3	26.0	26.8	22.0	22.1	30.3	28.9	22.7	20.4	48.0	50.5	58.3
18:50	1100	53.73	44.66	0.521	38.0	38.8	38.4	38.5	27.3	28.1	26.8	27.6	22.0	22.1	31.6	30.1	23.4	21.0			58.5
18:55	1100	54.13	44.99	0.520	38.8	39.6	39.3	39.4	28.1	28.9	27.6	28.4	22.1	22.2	32.5	31.0	24.1	21.8			58.7
19:00	1100	54.45	45.37	0.517	39.6	40.4	40.0	40.1	28.6	29.3	27.9	28.7	22.2	22.3	33.4	31.8	24.1	21.7	47.0	50.0	58.3
19:05	1100	54.66	45.57	0.518	39.5	40.3	39.9	40.1	28.6	29.5	28.2	29.0	22.3	22.3	33.8	32.2	24.6	21.9			59.0
19:10	1100	54.95	45.77	0.518	39.8	40.6	40.2	40.4	28.7	29.4	28.0	28.9	22.4	22.4	34.1	32.6	24.3	21.9	48.0	53.0	59.0
19:15	1100	55.21	46.00	0.521	39.9	40.7	40.3	40.5	28.9	29.7	28.4	29.1	22.5	22.5	34.5	32.9	24.9	22.4			58.5
19:20	1100	55.53	46.12	0.518	40.0	40.8	40.5	40.7	29.2	29.8	28.4	29.2	22.6	22.6	34.7	33.1	24.8	22.4	47.0	55.0	58.5
19:25	1100	55.77	46.44	0.518	40.3	41.1	40.7	40.9	29.0	30.1	28.7	29.5	22.7	22.7	34.9	33.2	24.7	21.9			58.7
19:30	1100	56.00	46.64	0.518	40.5	41.1	40.9	41.1	29.0	29.8	28.5	29.3	22.8	22.9	35.1	33.4	24.5	21.9	48.5	55.0	58.5
19:35	1100	56.28	46.89	0.518	40.4	41.3	40.9	41.1	29.3	30.2	28.9	29.7	22.9	23.0	35.3	33.5	25.1	22.3	49.0	54.0	58.3
19:40	1100	56.49	47.11	0.516	40.4	41.4	41.0	41.2	29.4	30.4	29.0	29.8	22.9	23.1	35.3	33.6	25.1	22.2			58.3
19:45	1100	56.72	47.30	0.515	40.6	41.5	41.1	41.3	29.4	30.2	28.8	29.6	23.0	23.2	35.4	33.8	24.6	21.9	49.0	54.5	58.5
19:50	1100	56.94	47.50	0.516	40.4	41.4	41.0	41.2	29.2	30.1	28.6	29.4	23.1	23.3	35.5	33.8	24.6	22.1			58.3
19:55	1100	57.19	47.70	0.516	40.3	41.5	41.1	41.4	29.5	30.5	29.1	29.9	23.2	23.4	35.6	34.0	25.3	22.4			58.0
20:00	1100	57.47	47.93	0.516	40.6	41.7	41.3	41.6	29.7	30.5	29.1	29.9	23.3	23.5	35.7	34.0	24.8	22.0	49.0	55.0	57.5
20:05	1100	57.64	48.05	0.516	40.5	41.6	41.2	41.4	29.3	30.2	28.8	29.6	23.4	23.6	35.8	34.1	24.7	21.9			57.5
20:10	1100	57.83	48.32	0.514	40.5	41.5	41.2	41.4	29.5	30.4	29.0	29.8	23.4	23.7	35.8	34.1	25.3	22.5	49.0	55.0	57.5
20:15	1100	58.14	48.52	0.515	40.5	41.6	41.3	41.5	29.7	30.6	29.3	30.1	23.5	23.8	35.9	34.2	25.3	22.4			57.1
20:20	1100	58.33	48.69	0.516	40.7	41.6	41.2	41.4	29.3	30.2	28.8	29.6	23.6	23.9	35.9	34.2	24.8	22.1	49.0	55.0	57.5
20:25	1100	58.58	48.77	0.518	40.9	41.8	41.4	41.6	29.5	30.4	29.0	29.8	23.7	23.9	36.0	34.2	25.2	22.4			59.0
20:30	1100	58.88	49.03	0.518	41.3	42.1	41.7	41.9	29.8	30.6	29.2	30.1	23.8	24.0	36.2	34.4	24.8	21.9			57.8
20:35	1100	59.08	49.24	0.517	41.0	41.8	41.7	41.8	29.8	30.7	29.4	30.1	23.9	24.1	36.2	34.5	24.8	22.4			58.5
20:40	1100	59.32	49.46	0.515	41.2	42.0	41.6	41.9	30.0	31.0	29.6	30.4	23.9	24.2	36.2	34.6	25.3	22.4	49.0	54.0	58.3
20:45	1100	59.54	49.66	0.516	41.4	42.0	41.7	41.9	29.8	30.7	29.2	30.1	24.0	24.3	36.3	34.6	25.3	22.3			58.3
20:50	1100	59.73	49.86	0.514	41.4	42.1	41.7	41.9	29.8	30.7	29.2	30.1	24.1	24.3	36.3	34.6	24.8	21.9	49.0	54.0	59.0
20:55	1100	59.98	50.04	0.516	41.5	42.2	41.8	42.0	30.0	30.9	29.4	30.3	24.1	24.4	36.3	34.7	24.9	21.9			59.0
21:00	1100	60.12	50.16	0.515	41.3	42.0	41.6	41.8	29.7	30.7	29.2	30.1	24.2	24.5	36.3	34.7	25.2	22.4			58.3
21:05	1100	60.47	50.40	0.516	41.5	42.3	41.9	42.1	30.2	31.2	29.7	30.5	24.3	24.6	36.4	34.7	25.1	22.1	48.0	52.0	58.7
21:10	1100	60.65	50.58	0.517	41.7	42.3	41.6	41.8	30.1	31.0	29.4	30.3	24.4	24.6	36.5	34.8	25.3	21.9			58.7
21:15	1100	60.79	50.74	0.515	41.3	42.3	41.9	42.1	29.9	30.9	29.5	30.3	24.4	24.7	36.4	34.8	24.9	22.5	47.0	51.5	57.8
21:20	1100	61.10	50.96	0.514	41.7	42.0	42.0	41.8	30.2	31.0	29.6	30.4	24.5	24.8	36.5	34.9	24.9	22.1	47.0	51.0	59.0
21:25	1100	61.30	51.15	0.515	41.7	42.4	42.0	42.2	30.1	31.0	29.5	30.4	24.6	24.8	36.5	34.8	24.8	22.5			58.7
21:30	1100	61.45	51.30	0.515	41.5	42.2	41.8	42.0	29.9	30.8	29.4	30.2	24.6	24.9	36.5	34.7	24.8	21.9	47.0	51.0	58.5
21:35	1096	57.75	57.78	0.000	32.2	32.4	32.5	32.8	24.5	24.6	24.0	24.2	24.9	24.5	34.5	33.2	22.2	21.9	47.0	51.0	58.7
21:42	0	58.03	58.05	0.000	31.8	32.1	30.9	31.2	25.6	25.6	24.8	25.3	24.8	24.5	33.8	32.3	21.7	21.7			

Date: 13/05/1994
Test: N3 INCR

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
13:59	0	48.12	48.12	0.000	15.9	16.4	13.7	14.4	14.5	13.8	12.2	13.8	19.2	19.2	17.9	18.2	17.4	17.4	53.0	63.0	58.3
14:00	400	48.73	47.82	0.164	17.4	18.1	16.7	17.4	17.4	17.6	16.8	17.2	19.1	19.1	18.0	18.3	17.4	17.3			58.3
14:01	420	48.88	47.87	0.173	18.2	18.8	17.9	18.4	17.6	17.8	17.0	17.5	19.1	19.1	18.1	18.3	17.4	17.3	53.0	62.5	58.0
14:02	440	49.00	47.88	0.181	18.6	19.1	18.4	18.9	17.6	17.8	17.1	17.5	19.1	19.1	18.2	18.4	17.4	17.3			58.6
14:04	460	49.14	47.92	0.190	18.9	19.4	18.9	19.3	17.7	17.9	17.1	17.6	19.1	19.1	18.3	18.5	17.5	17.3	52.5	62.0	58.7
14:07	480	49.31	47.96	0.200	19.2	19.7	19.3	19.7	17.7	18.0	17.2	17.7	19.1	19.1	18.5	18.7	17.5	17.3			58.3
14:10	500	49.48	48.00	0.209	19.5	20.0	19.6	20.0	17.8	18.0	17.3	17.8	19.1	19.1	18.7	18.8	17.5	17.3	52.5	62.0	58.3
14:13	520	49.65	48.04	0.217	19.7	20.3	19.8	20.2	17.9	18.1	17.4	17.8	19.1	19.2	18.8	18.9	17.5	17.3			58.0
14:15	540	49.81	48.06	0.226	20.0	20.5	20.1	20.5	18.0	18.2	17.4	17.9	19.1	19.1	18.9	19.0	17.6	17.3	52.0	61.5	58.3
14:17	560	49.94	48.06	0.236	20.2	20.8	20.3	20.7	18.0	18.3	17.5	18.0	19.1	19.1	19.1	19.1	17.6	17.3			58.4
14:19	580	50.10	48.08	0.244	20.5	21.1	20.7	21.0	18.1	18.4	17.6	18.1	19.1	19.1	19.2	19.3	17.7	17.3	52.0	61.0	58.3
14:21	600	50.25	48.06	0.253	20.8	21.4	21.0	21.3	18.2	18.5	17.7	18.2	19.1	19.1	19.4	19.4	17.7	17.3			58.5
14:23	620	50.41	48.07	0.263	21.1	21.7	21.3	21.7	18.4	18.7	17.8	18.3	19.1	19.1	19.5	19.5	17.8	17.3	52.0	61.0	57.8
14:25	640	50.55	48.04	0.272	21.5	22.1	21.6	22.0	18.5	18.8	18.0	18.5	19.1	19.1	19.7	19.7	17.8	17.4			58.3
14:27	660	50.75	48.07	0.281	21.9	22.5	22.1	22.4	18.7	19.0	18.2	18.7	19.1	19.1	20.0	19.9	17.9	17.4	52.5	61.0	57.8
14:29	680	50.94	48.07	0.288	22.4	23.0	22.5	22.9	18.9	19.3	18.4	18.9	19.1	19.1	20.2	20.1	18.1	17.5			58.5
14:32	700	51.13	48.08	0.296	22.8	23.5	23.0	23.4	19.1	19.5	18.6	19.2	19.1	19.1	20.5	20.3	18.2	17.6	52.0	61.0	58.5
14:34	720	51.33	48.09	0.307	23.3	23.9	23.5	23.8	19.3	19.7	18.8	19.4	19.1	19.1	20.8	20.6	18.3	17.6			58.5
14:36	740	51.50	48.08	0.316	23.7	24.4	23.9	24.2	19.5	19.9	19.0	19.6	19.1	19.1	21.0	20.7	18.4	17.7	52.5	61.0	58.5
14:37	760	51.68	48.06	0.323	24.2	24.8	24.4	24.8	19.8	20.2	19.3	19.9	19.1	19.1	21.3	21.0	18.6	17.8			59.2
14:40	780	51.91	48.10	0.333	24.8	25.5	25.0	25.4	20.1	20.5	19.6	20.2	19.1	19.1	21.7	21.3	18.8	17.9	52.0	62.0	58.7
14:42	800	52.15	48.08	0.342	25.4	26.1	25.7	26.0	20.4	20.9	19.9	20.5	19.1	19.1	22.1	21.7	18.9	18.0			58.5
14:44	820	52.36	48.10	0.351	26.0	26.7	26.2	26.5	20.6	21.2	20.1	20.8	19.1	19.1	22.5	22.0	19.1	18.1	52.0	61.5	58.7
14:46	840	52.60	48.08	0.360	26.6	27.3	26.8	27.2	21.0	21.5	20.5	21.1	19.2	19.2	22.9	22.3	19.3	18.2			58.0
14:49	860	52.81	48.10	0.367	27.2	27.9	27.5	27.8	21.3	21.9	20.8	21.5	19.2	19.2	23.3	22.8	19.5	18.3	53.0	62.0	57.5
14:51	880	53.11	48.12	0.377	28.1	28.9	28.4	28.7	21.8	22.4	21.3	21.9	19.2	19.2	23.9	23.2	19.8	18.5			59.0
14:54	900	53.32	48.14	0.387	28.6	29.4	29.0	29.3	22.2	22.8	21.7	22.3	19.3	19.3	24.3	23.6	20.0	18.7	52.5	62.0	58.6
14:56	920	53.60	48.13	0.394	29.5	30.2	29.8	30.1	22.6	23.3	22.1	22.8	19.3	19.3	24.8	24.0	20.3	18.9			58.5
14:58	940	53.86	48.17	0.403	30.4	31.2	30.7	31.0	23.1	23.8	22.6	23.3	19.4	19.4	25.4	24.5	20.6	19.0	53.0	62.0	58.1
15:00	960	54.13	48.20	0.411	31.1	31.9	31.4	31.7	23.5	24.3	23.0	23.8	19.4	19.5	25.9	24.9	20.9	19.2			58.5
15:02	980	54.41	48.21	0.418	32.0	32.8	32.3	32.6	24.1	24.8	23.5	24.3	19.5	19.5	26.5	25.4	21.2	19.4	52.5	62.0	58.7
15:05	1000	54.71	48.22	0.429	32.9	33.7	33.2	33.5	24.6	25.4	24.1	24.9	19.5	19.6	27.1	25.9	21.6	19.7			58.4
15:07	1020	54.98	48.27	0.437	33.8	34.6	34.1	34.4	25.1	26.0	24.6	25.4	19.6	19.6	27.8	26.4	21.9	19.9	52.5	62.0	58.1
15:09	1040	55.24	48.27	0.444	34.6	35.4	34.9	35.2	25.6	26.5	25.1	25.9	19.7	19.7	28.3	26.9	22.2	20.1			58.9
15:11	1060	55.51	48.28	0.452	35.5	36.4	35.8	36.1	26.2	27.1	25.7	26.5	19.8	19.8	28.9	27.5	22.5	20.3	52.0	62.0	57.8
15:13	1080	55.81	48.26	0.462	36.5	37.4	36.9	37.2	26.8	27.8	26.3	27.1	19.9	19.9	29.6	28.0	22.9	20.6			58.5
15:15	1100	56.12	48.32	0.468	37.5	38.4	37.9	38.1	27.4	28.4	26.9	27.8	20.0	20.0	30.3	28.8	23.4	20.8	53.0	62.0	59.0
15:18	1120	56.45	48.33	0.476	38.6	39.4	38.9	39.2	28.0	29.2	27.6	28.5	20.1	20.1	31.1	29.3	23.8	21.1			58.4
15:20	1140	56.77	48.36	0.484	39.7	40.6	40.0	40.3	28.7	29.8	28.2	29.1	20.2	20.3	31.8	29.9	24.2	21.4	52.5	62.0	58.7
15:22	1160	57.08	48.36	0.492	40.6	41.5	41.0	41.2	29.3	30.5	28.8	29.7	20.2	20.3	32.4	30.4	24.5	21.6	52.5	62.0	58.7
15:29	0	53.76	53.77	0.000	32.9	33.2	32.4	32.5	24.5	24.7	23.6	24.4	20.2	20.2	31.2	29.8	21.7	21.7	52.0	61.5	59.2

Date: 17/05/1994
Test: N3 MAX1

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
10:05	0	47.42	47.42	0.000	12.2	13.6	11.4	11.8	14.1	12.9	11.4	12.8	18.5	18.1	17.2	17.6	15.7	15.8			
10:15	1100	51.44	44.02	0.473	28.4	30.1	28.7	29.4	21.3	22.3	21.0	21.7	18.3	18.0	20.5	19.7	18.1	15.9			58.3
10:20	1100	52.03	44.64	0.471	33.1	34.2	33.8	33.9	23.1	24.0	22.6	23.5	18.4	18.1	25.2	24.0	19.4	17.1	49.5	55.0	57.8
10:25	1100	52.43	45.05	0.470	34.2	35.3	34.9	35.0	24.0	24.9	23.5	24.3	18.5	18.3	27.2	25.9	20.2	17.9			57.8
10:30	1100	52.84	45.41	0.469	35.3	36.4	35.9	36.1	24.9	25.9	24.5	25.3	18.7	18.4	28.6	27.2	21.1	18.7	49.5	55.5	58.0
10:35	1100	53.21	47.76	0.469	36.3	37.2	36.8	37.0	25.7	26.7	25.3	26.1	18.8	18.6	29.7	28.2	21.9	19.4			57.3
10:40	1100	53.53	46.04	0.468	37.0	38.0	37.6	37.7	26.4	27.4	25.9	26.8	19.0	18.8	30.6	29.0	22.5	20.0	50.0	56.0	58.0
10:45	1102	53.90	46.40	0.470	37.8	38.7	38.3	38.4	27.1	28.1	26.6	27.4	19.2	19.0	31.4	29.7	23.2	20.7			58.7
10:50	1100	54.24	46.66	0.468	38.5	39.4	39.0	39.2	27.8	28.8	27.3	28.1	19.5	19.3	32.1	30.3	23.8	21.3	50.0	56.0	57.8
10:55	1100	54.60	47.03	0.467	39.3	40.2	39.8	40.0	28.6	29.6	28.1	28.9	19.7	19.6	32.8	31.0	24.6	22.1			57.8
11:00	1100	54.85	47.26	0.465	39.6	40.5	40.1	40.2	28.6	29.6	28.0	28.9	19.9	19.8	33.3	31.5	24.5	22.0	50.0	55.5	57.5
11:05	1100	55.10	47.48	0.467	39.7	40.5	40.2	40.3	28.8	29.7	28.2	29.1	20.1	20.0	33.7	31.9	24.8	22.3			57.3
11:10	1100	55.41	47.74	0.465	40.0	40.9	40.5	40.7	29.2	30.2	28.7	29.5	20.4	20.3	34.1	32.3	25.1	22.3	50.0	56.0	58.5
11:15	1100	55.60	47.92	0.465	39.9	40.7	40.4	40.5	28.7	29.8	28.2	29.1	20.6	20.5	34.2	32.4	24.7	22.2			58.7
11:20	1100	55.87	48.18	0.465	40.1	41.0	40.6	40.8	29.0	30.0	28.5	29.3	20.8	20.7	34.5	32.7	24.8	21.9	50.5	56.5	58.3
11:25	1100	56.09	48.37	0.465	40.1	40.9	40.6	40.7	29.0	30.0	28.4	29.3	21.0	20.9	34.6	32.8	24.9	22.3			57.8
11:30	1100	56.35	48.60	0.465	40.3	41.1	40.8	40.9	29.1	30.1	28.5	29.4	21.2	21.2	34.8	32.9	24.8	21.8	51.0	57.0	58.3
11:35	1100	56.73	48.93	0.465	41.1	42.1	41.7	41.8	30.3	31.4	29.8	30.7	21.4	21.4	35.2	33.3	26.3	21.9			54.1
11:40	1100	56.87	49.07	0.465	40.7	41.6	41.3	41.5	29.5	30.4	28.9	29.8	21.6	21.6	35.3	33.5	24.9	22.2			41.5
11:45	1100	57.12	49.22	0.465	40.6	41.6	41.2	41.4	29.4	30.4	28.8	29.7	21.8	21.8	35.2	33.3	24.9	22.1	52.0	58.0	58.3
11:50	1100	57.32	49.43	0.465	40.5	41.5	41.1	41.3	29.4	30.4	28.8	29.7	22.0	21.9	35.3	33.3	24.9	21.9			57.8
11:55	1100	57.59	49.63	0.467	40.6	41.7	41.3	41.5	29.7	30.7	29.1	30.0	22.1	22.1	35.3	33.5	25.0	22.1	52.0	59.0	58.7
12:00	1100	57.75	49.81	0.464	40.6	41.6	41.3	41.4	29.5	30.5	28.9	29.8	22.3	22.2	35.5	33.6	24.8	22.0	52.0	59.0	58.0
12:05	1100	57.96	50.02	0.464	40.6	41.6	41.2	41.3	29.4	30.4	28.8	29.7	22.4	22.4	35.5	33.6	24.7	21.9			58.3
12:10	1100	58.22	50.22	0.465	40.8	41.8	41.5	41.6	29.7	30.7	29.1	30.0	22.5	22.6	35.6	33.7	24.9	22.0			58.5
12:15	1100	58.46	50.45	0.463	40.9	41.9	41.6	41.7	29.9	30.9	29.3	30.2	22.7	22.7	35.7	33.7	25.1	22.1	52.0	60.0	57.5
12:20	1100	58.70	50.61	0.464	40.8	41.9	41.5	41.7	29.9	31.0	29.4	30.2	22.9	22.9	35.8	33.9	25.5	22.6		60.0	58.3
12:25	1100	58.92	50.75	0.467	40.8	41.9	41.5	41.8	29.8	30.9	29.3	30.1	23.0	23.0	35.8	34.0	25.3	22.5	53.0	60.0	57.1
12:30	1100	59.11	51.00	0.464	41.0	42.0	41.6	41.7	29.9	30.9	29.2	30.1	23.1	23.1	35.9	34.2	25.0	22.0			58.3
12:35	1100	59.32	51.11	0.465	40.8	41.9	41.6	41.7	29.9	30.8	29.2	30.1	23.2	23.2	35.9	34.2	24.9	21.9			58.3
12:39	1100	59.50	51.35	0.463	40.7	41.9	41.5	41.7	30.1	31.1	29.5	30.4	23.3	23.3	35.9	34.2	25.4	22.3	54.0	61.0	57.5
12:45	0	56.48	56.51	0.001	34.2	35.1	34.9	35.0	25.7	26.0	25.2	25.6	23.3	23.2	34.7	33.0	22.1	21.8	54.0	61.0	57.3
12:50	0	56.60	56.62	0.001	33.0	34.0	32.3	32.4	26.2	26.3	25.0	26.0	23.3	23.1	34.1	32.5	21.8	21.7	55.0	62.0	57.1

Date: 16/05/1994
Test: N3 MAX2

Time	RPM	H (kPa)	P (kPa)	M	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	Twet (°F)	Tdry (°F)	q (l/s)
18:35	0	47.67	47.67	0.000	14.0	15.1	12.5	13.0	14.0	13.2	11.5	13.1	18.2	17.9	16.9	13.3	18.4	18.3	54.5	60.0	57.5
18:40	1101	51.59	44.26	0.473	25.7	28.0	26.4	27.8	22.8	23.9	22.6	23.3	18.2	18.0	19.9	19.3	20.4	18.3			57.5
18:45	1101	52.38	44.97	0.471	34.5	35.8	35.4	35.5	25.0	26.0	24.6	25.4	18.4	18.2	25.6	24.1	21.6	19.3	55.0	60.0	58.0
18:50	1100	52.81	45.39	0.471	36.0	37.3	36.8	36.9	26.1	27.0	25.6	26.4	18.6	18.4	28.0	26.5	22.5	20.2			58.7
18:55	1099	53.23	45.78	0.469	37.0	38.2	37.9	38.0	27.0	28.0	26.6	27.4	18.8	18.7	29.6	28.0	23.4	21.0			57.8
19:00	1099	53.61	46.16	0.467	38.3	39.2	38.8	38.9	27.9	28.8	27.4	28.2	19.0	18.9	30.9	29.2	24.1	21.8	55.0	60.0	57.8
19:05	1098	53.99	46.50	0.467	39.1	40.1	39.7	39.8	28.6	29.5	28.0	28.8	19.3	19.2	31.9	30.1	24.4	21.9			58.3
19:10	1100	54.24	46.74	0.467	39.3	40.2	39.9	40.0	28.6	29.5	28.0	28.9	19.5	19.5	32.6	30.7	24.7	22.4	54.5	59.5	59.2
19:15	1100	54.56	47.00	0.467	39.7	40.7	40.3	40.5	29.1	30.1	28.6	29.4	19.7	19.7	33.1	31.2	24.9	22.3			58.3
19:20	1099	54.81	47.26	0.466	39.9	40.8	40.5	40.6	28.9	29.9	28.3	29.2	20.0	20.0	33.6	31.7	24.9	22.5	55.0	59.5	58.5
19:25	1098	55.05	47.45	0.465	40.0	40.9	40.5	40.7	28.9	29.9	28.4	29.2	20.2	20.2	33.8	31.9	24.6	22.0			57.8
19:30	1098	55.31	47.68	0.466	40.2	41.0	40.7	40.8	29.0	30.0	28.4	29.3	20.4	20.4	34.1	32.1	24.6	22.0	55.0	60.0	58.7
19:35	1098	55.58	47.93	0.465	40.2	41.0	40.6	40.8	29.2	30.6	28.7	29.5	20.6	20.6	34.3	32.3	25.1	22.4			57.5
19:40	1099	55.85	48.17	0.465	40.5	41.3	40.9	41.1	29.5	30.4	28.9	29.7	20.8	20.9	34.4	32.5	25.0	22.2	54.5	59.5	57.3
19:45	1097	56.04	48.33	0.464	40.3	41.2	40.8	41.0	29.1	30.1	28.5	29.4	21.0	21.1	34.6	32.7	24.7	22.1			57.3
19:50	1100	56.28	48.56	0.464	40.4	41.3	40.9	41.1	29.2	30.2	28.6	29.5	21.2	21.2	34.8	32.9	24.7	21.9			58.3
19:55	1096	56.54	48.77	0.464	40.6	41.4	41.1	41.2	29.3	30.3	28.7	29.6	21.3	21.4	34.9	33.0	24.8	22.0	55.0	59.5	57.3
20:00	1099	56.77	48.94	0.465	40.5	41.4	41.1	41.2	29.3	30.3	28.7	29.5	21.5	21.6	35.0	33.2	24.7	21.8	54.0	59.0	57.5
20:05	1098	57.05	49.18	0.465	40.6	41.6	41.2	41.4	29.7	30.7	29.1	29.9	21.7	21.8	35.1	33.2	25.1	22.2			57.8
20:10	1097	57.25	49.38	0.466	40.6	41.5	41.2	41.4	29.6	30.7	29.1	29.9	21.9	22.0	35.2	33.3	25.4	22.5	53.5	59.0	57.8
20:15	1098	57.48	49.53	0.466	40.7	41.6	41.3	41.5	29.5	30.5	28.9	29.8	22.0	22.1	35.2	33.4	24.8	22.0			57.5
20:20	1096	57.68	49.75	0.464	40.1	41.5	41.2	41.4	29.5	30.6	29.0	29.9	22.2	22.3	35.3	33.4	25.2	22.5	53.0	59.0	58.7
20:25	1095	57.89	49.95	0.466	40.2	41.6	41.3	41.5	29.5	30.5	28.9	29.8	22.3	22.4	35.4	33.4	24.8	22.0			58.5
20:30	1100	58.16	50.16	0.465	40.3	41.8	41.4	41.6	29.5	30.5	28.9	29.8	22.5	22.6	35.4	33.6	24.7	22.0	52.5	58.5	57.3
20:35	1100	58.43	50.38	0.465	40.9	42.1	41.7	41.9	30.1	31.2	29.5	30.4	22.6	22.7	35.6	33.7	25.4	22.4			57.5
20:40	1102	58.66	50.59	0.466	40.5	42.0	41.6	41.8	29.8	30.8	29.2	30.0	22.8	22.8	35.7	33.9	24.9	21.9	52.5	58.0	57.5
20:45	1102	58.83	50.74	0.464	40.4	41.8	41.5	41.7	29.6	30.7	29.0	29.9	22.9	23.0	35.6	33.9	24.8	22.0			57.8
20:50	1096	59.05	50.96	0.464	40.5	41.9	41.6	41.7	29.7	30.8	29.2	30.0	23.0	23.1	35.7	34.0	24.9	22.0	52.0	58.0	57.5
20:55	1095	59.30	51.22	0.463	40.4	42.1	41.7	41.9	30.1	31.1	29.5	30.3	23.1	23.2	35.8	34.0	25.1	22.1			57.5
21:00	1099	59.54	51.40	0.462	39.9	42.1	41.8	42.0	30.0	31.1	29.4	30.3	23.2	23.3	35.9	34.1	25.1	22.2	52.0	58.5	57.8
21:05	1095	59.72	51.58	0.463	40.0	42.2	41.9	42.0	30.0	31.1	29.6	30.3	23.4	23.4	36.0	34.2	25.1	22.1			57.3
21:10	1098	59.98	51.79	0.463	40.2	42.3	41.9	42.1	30.2	31.2	29.6	30.5	23.5	23.6	36.1	34.3	25.3	22.3	52.0	58.0	57.3
21:15	0	56.96	56.99	0.000	32.9	35.5	35.1	35.3	26.1	26.3	25.4	25.9	23.4	23.4	34.9	33.5	22.3	22.3			57.5

A.6 Sound Level Data

Test Date: 9 May 1994
Test: N1 INCR
Notes:
1. All sound data is measured in dBa.
2. RPM = 580: Machinery running nearby, when it ceased readings were Peak 66, Slow 53.
3. RPM = 940: Cars leaving the site.

RPM	Location on AMRL Site							
	1		2		3		4	
	Peak	Slow	Peak	Slow	Peak	Slow	Peak	Slow
0	72	54	72	59	72	60	72	60
400	79	52	73	60	70	59	71	55
420	76	53						
440			72	52				
460					72	61		
480							65	55
500	68	57						
520			73	62				
540					81	68		
560							77	65
580	85	75						
600			75	61				
620					74	60		
640							66	55
660	71	60						
680			72	60				
700					72	60		
720							69	55
740	75	57						
760			73	60				
780					72	62	70	57
840	75	58						
860			68	55				
900					70	58	70	57
920								
940	80	65						
960			67	54				
980					71	59		
1000							74	58
1020	79	64						
1040			75	63				
1080					71	59		
1100							74	62
1120	79	66						
1140			68	55				
1160					72	62		
0	70	57	67	55	70	57	74	57

Test Date: 10 May 1994
Test: N1 MAX1 (Day test)
Notes: 1. All sound data is measured in dBa.
          2. Outside building 13: Peak 98, Slow 86; inside control room: Peak 101, Slow 90.

| RPM | Location on AMRL Site | | | | | | | |
| | 1 | | 2 | | 3 | | 4 | |
	Peak	Slow	Peak	Slow	Peak	Slow	Peak	Slow
0	72	64	74	55	74	58	69	55
1100	78	58	67	55	80	65	80	62
1100	73	61	72	60	71	59	71	57
1100	72	64	68	55	70	57	70	58
1100	71	59	68	56	69	56	72	56

Test Date: 10 May 1994
Test: N1 MAX2 (Night test)
Notes: 1. All sound data is measured in dBa.

| RPM | Location on AMRL Site | | | | | | | |
| | 1 | | 2 | | 3 | | 4 | |
	Peak	Slow	Peak	Slow	Peak	Slow	Peak	Slow
0	65	55	72	62	67	52	65	53
1100	72	61	73	62	72	61	73	59
1100	72	61	74	62	75	57	76	59
1100	72	58	73	61	69	58	70	55
1100	71	55	72	60	70	58	69	58
1100	68	54	72	61	69	56	71	58
1100	71	57	72	61	70	58	69	55
1100	68	55	72	59	68	55	71	56
1100	70	57	72	61	68	56	71	58
1100	69	56	68	55	67	54	69	56
1100	71	58	68	56	67	54	68	57
1100	70	58	68	55	73	58	71	59
0	64	50	69	55	68	54	68	53

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Yoel Link and Howard Quick

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Pressure, Transonic wind tunnels, Compressors, Noise, Measurement

19. ABSTRACT
A detailed test programme of the AMRL Transonic Wind Tunnel was conducted. The objective of the test programme was to determine the pressure distributions around the tunnel circuit with larger nozzle exit areas. The existing high speed contraction, test section, model support mechanism, and downstream diffuser were removed for the tests. A variable nozzle and collector were designed and installed in place of the removed components to determine the effects of increasing the nozzle exit area. Three nozzle configurations were investigated, with a 38.3%, 44.4% and 58.1% increase in area relative to the existing test section area. Measurements were made of static pressure around the tunnel circuit, total pressure upstream and downstream from the compressor, and temperatures at various locations. Noise measurements were also made outside the tunnel complex and at four locations around the boundary of the site to determine the noise level of the wind tunnel.